



# CHEMICAL ABSTRACTS

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## 1—APPARATUS

C. G. HERICK

**Platinum substitutes.** K. ARNDT. *Elektrotechn. Z.* 42, 345-6(1921).—For electroanalysis, Pt-plated Au alloy (5% Ag, 3% Cu) has been found serviceable. Pt-plated Ta anodes have also been used with success. In the electrolytic production of perborate, persulfuric acid, perchlorates, etc., Pt anodes are still used, as a suitable substitute has not as yet been found. Pt is likewise still used in large quantities as a catalyzer in the contact  $\text{H}_2\text{SO}_4$  process and in the Ostwald  $\text{NH}_3 \rightarrow \text{HNO}_3$  process. For incandescent lamps and other similar app., Pt is no longer employed; the copper-clad Ni steel wire (Dumet) is used instead. In place of Pt contacts, W contacts are now usually substituted. The consumption of Pt for dental pins continues to be considerable.

C. G. F.

**Electrical pyrometry.** ANON. *Elektrochem. Z.* 27, 46, 62, 63, 72, 81, 85(1920-21).—A detailed illus. review.

C. G. F.

**Cottrell's ebullioscopic apparatus.** JAMES FREDERICK SPENCER. Univ. London. *J. Am. Chem. Soc.* 43, 301-2(1921).—In order to make this app. (C. A. 13, 1172) more serviceable to relatively inexperienced students it was altered as follows. The condenser attached to the boiling tube was made separate from the jacket and attached by means of a ground joint. The pump was made entirely loose from the inner protecting jacket and had its funnel resting on the bottom of the boiling tube and three small glass pellets were fused to points equidistant from one another on the rim of the funnel. A 3-armed pump was used in which the arms were placed at  $120^\circ$  angle to one another and were connected at their juncture with the funnel tube. Two glass pellets were fused to each of the upper tubes to prevent them from touching the inner walls of the protecting jacket.

G. W. STRATTON

**A gas generating apparatus.** ARTHUR W. BULL. *Chem. Met. Eng.* 24, 249-50(1921).—The author characterizes this as "a combination of previous ideas resulting in an improved generator using the principles of both the acid spray and the Kipp type." It is automatic and uses acid with 96% efficiency.

JEROME ALEXANDER

**Separatory funnel for quantitative extraction.** R. LUTHER. Dresden. *Z. angew. Chem.* 34, *Aufsatzteil*, 66-7(1921); 1 cut.—In the usual type of funnel it is difficult to drain the stem, but in this there is a small open funnel attached to the cock opposite the stem. The plug of the cock is bored obliquely, so that in 1 position it connects the separatory funnel with the stem, but when turned  $180^\circ$  it connects the small open funnel, through a tunnel on the lower side of the cock, with the stem, thus allowing the liquid in the stem to run out and the stem to be washed.

Made by R. Götz, Leipzig.

J. H. MOORE

**A constantly ready apparatus for slowly aspirating gases.** C. HASSLER. Oberhausen. *Chem. Ztg.* 45, 247(1921); 1 cut.—The app. rests on the principle of the inverted wash-bottle. Two strong 2-l. glass flasks with short ringed necks are connected by means of a long rubber stopper and a clamp over the rings, and are connected internally by means of a short glass tube through the stopper. Two tubes enter each flask near the base of the neck, 1 tube extending nearly to the bottom of the flask while the other curves upward into the neck, ending just below the stopper. Both tubes

carry cocks on the outer end. To operate, 1 flask is nearly filled with  $H_2O$  and the app. is stood with the filled flask uppermost, the gas being drawn in as the  $H_2O$  flows through the tube into the lower flask, the air in this flask escaping through the short tube through the side of the neck. When the upper flask is empty the app. is reversed for the next expt. J. H. MOORE

Simple means of holding the water constant in water-baths. HANS HALLER. Munich. *Chem.-Ztg.* 45, 221(1921).—A T-tube is inserted in a stopper near the bottom of the bath, the stem of the T pointing upward. The other arm of the T is attached to the  $H_2O$  supply, the top of the stem being connected with a drain to take the excess  $H_2O$ . The height of  $H_2O$  in the bath is regulated by the angle at which the stem rises. J. H. MOORE

Concentration of solutions. E. CRIVELLI. *Ann. chim. sci. ind.* [1a-2a] 35-36, 3-54(1920).—An extensive illustrated review of all the different kinds of app. used for concn. and evapn. in chem. industry. E. FIERIZ

Crystallization. E. CRIVELLI. *Ann. chim. sci. ind.* [1a-2a] 35-6, 98-134(1920).—An illustrated review covering app. for crystn. and sublimation used in the inorg. industry. E. FIERIZ

Small compressor. M. PRÜLSS. Dessau. *Chem.-Ztg.* 45, 220(1921).—A brief description, with 3 cuts, of a compact app., made in sizes to deliver about 3, 11, 13, and 30 cu. m. of air per hr. at 90 lbs. pressure. On account of its portability and little attention required it is adapted to many uses in a factory. J. H. MOORE

The usefulness of condensate traps in distillation plants. FR. BÜRK. Mannheim-Waldhof. *Chem. App.* 8, 49-51(1921).—B. discusses traps based on (1) the expansion and contraction of a metal or liquid, (2) on the action of a float, and (3) on the choking or throttling of the steam in narrow passages. The float is the most reliable of these, but none of them is as reliable and satisfactory as the condensate pump. J. H. MOORE

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#### Storage and handling of potash (ZIMMER) 18.

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Gas-analyzing apparatus. O. RÖDHE. U. S. 1,373,264, Mar. 29. Two measuring vessels of a gas-analyzing app., one employed to measure the gas before and the other after treatment with an absorption liquid, are cooled with liquid supplied from the same pipe. A portion of this liquid flows through a coil surrounding the second measuring vessel and another portion is led to the first measuring vessel, to maintain the 2 vessels at the same temp.

Apparatus for testing viscosity, etc. B. J. HALL and T. G. MARRIOR. Brit. 157,501, Aug. 27, 1919. App. for testing the consistency of asphaltic compns., colloids, and other viscous substances by penetration and applicable also generally for controlling an operation according to time includes a timing device controlled by a falling balanced lever.

Apparatus for estimating specific gravity. S. D. WELLS and R. J. MARX. Brit. 158,151, Jan. 21, 1920. App. is specified for continuously indicating and recording the sp. gr. of a flowing liquid, of the type in which the liquid flows through a balanced container system of const. vol.

Laboratory apparatus and supports. J. J. MOJONNIER. U. S. 1,372,243, Mar. 22. A series of supporting tables for chem. balances and other app. are mounted on adjacent frames with leveling and adjusting devices by means of which they can be adjusted for convenient handling of articles on the tables.

Mercury-vapor-jet pumps. SIEMENS & HALSKÉ AKT. GES. Brit. 157,118, Jan. 8, 1921. In Hg-vapor-jet pumps with an elec. arc generator for the vapor, the condensed Hg vapor is led back to the electrodes, which consist of receptacles filled

with Hg enclosed in the vapor space of the pump and arranged for mutual overflow of the liquid so as to regulate levels.

**Vacuum tubes.** STUDIEN-GES. FÜR ELEKTISCHE LEUCHTROHREN. Brit. 157,095, Jan. 8, 1921. In an elec. discharge lamp containing rare gas in which the illumination is produced by the "negative-glow," the cathode consists of a metallic conductor preferably arranged on a dark background of colored glass or other material.

**Electric discharge devices.** NAAMLÖÖZE VERNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 158,509, Jan. 20, 1921. Traces of gases, other than rare gases and H, are removed by introducing P into the bulb, for instance, by subliming red P.

**Electric discharge devices.** NAAMLÖÖZE VERNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 158,510, Jan. 20, 1921. Traces of gas, such as O or N, are removed from discharge lamps or thermionic valves by heating a N compd. of an alkali or alk.-earth metal, such as Ba, Sr or Ca nitride.

**Acetylene generator.** P. C. RUSHEN. Brit. 158,161, March 2, 1920. The carbide-feed table of an  $C_2H_2$  generator is provided with a shield operable manually by means exterior to the generator and adapted when in its raised position to embrace the table and prevent further delivery of carbide.

**Acetylene generator.** N. GOODYEAR. U. S. 1,373,419, Apr. 5.

**Apparatus for compressing carbon black or other finely divided materials.** W. W. McMAHAN. U. S. 1,372,181, Mar. 22.

**Apparatus for compressing carbon black or other pulverulent materials.** C. J. RANDALL and R. R. TAYLOR. U. S. 1,372,190, Mar. 22. The material to be compressed is enclosed within a flexible impervious receptacle which may be formed of rubber and, after the air is exhausted, the outside of the receptacle is subjected to fluid pressure to effect compression.

**Column still.** G. W. CRUPP. U. S. 1,372,649, Mar. 22.

**Still and condenser for water or other liquids.** C. D. CRANE. U. S. 1,372,865, Mar. 29.

**Still adapted for purifying gasoline or other volatile liquids.** H. A. HILLS. U. S. 1,372,880, Mar. 29. The app. is adapted for use in clothes cleaning establishments.

**Crucible furnace.** J. H. L. DEBATS. U. S. 1,372,676, Mar. 29. The bottom of the furnace, carrying the crucible, is mounted so that it can be raised and lowered.

**Saturators.** C. STULL. Brit. 157,223, Jan. 8, 1921. The invention relates to saturators for producing solid salts by the interaction of gases with liquids, and particularly to  $(NH_4)_2SO_4$  saturators.

## 2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON

John William Strutt, Baron Rayleigh. ARTHUR SCHUSTER. *Proc. Roy. Soc. (London)* 98A, 1-1(1921).—Biography. E. H.

A few words in memoriam of Achard. EDMUND O. VON LIPPMANN. *Deut. Zucker-ind.* 46, 210-2(1921).—Historical. F. W. ZERBAN

The conduction of research. F. H. NORTON. *Sci. Monthly* 12, 424-33(1921). E. H.

The reserves of the Chemical Warfare Service. CHARLES H. HERTY. *Nat. Research Council. Reprint and Circ. Series No. 16*, 17 pp.(1921). E. H.

Action of sodium sulfide on ferric oxide. J. C. WITT. *J. Am. Chem. Soc.* 43, 734-48(1921).—When  $Fe_2O_3$  is treated with an excess of  $Na_2S$  a black amorphous substance is formed. On removing most of the remaining  $Na_2S$  and adding  $H_2O$ , a brilliant green soln. is produced. The results obtained on studying the soln. indicate that the color is due to a colloid and not to a true soln. of some Fe compd. The exact compn. of the dis-



persed phase has not been detd. but apparently it contains neither S nor Na in chem. combination. The colloid is reversible. It is pptd. by a relatively large amt. of  $\text{Na}_2\text{S}$ , and is regenerated when the pptg. agent is removed. This process may be repeated several times.  $\text{Na}_2\text{S}$  acts also as a protecting agent. The sol can exist only in the presence of a small amt. of the sulfide. When the last trace is removed either by dialysis or by oxidation, the colloid is pptd. J. C. W.

The effect of copper and silver salts on the corrosion of iron by acids. OLIVER P. WATTS AND HAROLD C. KNAPP. *Trans. Am. Electrochem. Soc.* 39, reprint(1921).—The authors do not agree with W. D. Richardson that the addition of Ag or Cu salts to  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  solns. does not change the rate of corrosion of iron and steel in these acids (cf. Richardson, *C. A.* 15, 204). W. and K. took samples of ordinary sheet Fe, 0.25 Cu steel and commercially pure Fe (Armco) and immersed them in  $N$  and in 0.02  $N$   $\text{H}_2\text{SO}_4$  solns. at  $30^\circ$  for 24 hrs. They added from 0.1 up to 2.5 g. per l. of Cu and of Ag as sulfates and the effect of these salts on the corrosion rate was noted. The loss by voltaic action due to Cu or Ag is calcd. by deducting from the total loss in wt. the amt. of Fe that should be dissolved by the Cu or Ag (by replacement) and also the loss caused by the acid alone in the same test. It was found that with the larger amt. of Cu voltaic action is nearly 4 times the direct corrosion by acids, but with the smaller quantity of Cu salt voltaic action is somewhat less than corrosion of the Cu-steel by the acid. With ordinary steel voltaic action is about the same for either amt. of Cu salt. It could be shown that voltaic action by the addition of Cu or Ag salts does stimulate the corrosion of iron and mild steel by acids. (See also *Chem. Met. Eng.* 24, 842(1921)). C. G. F.

Humidity control by means of sulfuric acid solutions with critical compilation of vapor pressure data. ROBERT E. WILSON. *J. Ind. Eng. Chem.* 13, 326-31(1921).—While the paper does not suggest any new methods for obtaining humidity control, it presents in convenient form vapor pressure and other data which have been compiled from the literature, or found by practical experience, with reference to small-scale humidification by  $\text{H}_2\text{SO}_4$  solns. of definite compn. The advantages of  $\text{H}_2\text{SO}_4$  solns. for humidity control are pointed out and the practical use of the vapor-pressure chart is discussed. From the vapor-pressure chart contained in the paper, the concn. of  $\text{H}_2\text{SO}_4$  that must be employed to obtain a definite humidity at a given temp. is readily obtained. The detn. of humidity equil. and the method of calcg. temp. corrections are outlined.

H. JERMAIN CREIGHTON

A revision of the atomic weight of antimony. The analysis of antimony bromide. H. H. WILLARD AND R. K. MCALPINE. *J. Am. Chem. Soc.* 43, 797-818(1921).—Carefully prepared  $\text{SbBr}_3$  was analyzed first by detn. of its silver equivalence as usual, and second by weighing the  $\text{AgBr}$  pptd. by excess of  $\text{AgNO}_3$ , all precautions being observed. Averaging the volumetric results for 11 samples with the gravimetric results for 8 samples, the most probable at. wt. for Sb (assuming  $\text{Ag} = 107.880$ ) is 121.773.

JEROME ALEXANDER

Representation of the periodic system of the elements by a three-dimensional spiral. GEORGE SCHALTENBRAND. *Z. allgem. anorg. allgem. Chem.* 112, 221-4(1920).—The elements are arranged in order of at. wt. on an eccentric spiral. The spiral has turns of four kinds of increasing circumference. The first, smallest turn carries the elements H and He, and is followed by a larger turn corresponding with the first short period of the periodic table. The short turn is then repeated, carrying Ne and F, and in successive similar short turns appear an inactive element and a halogen. The long periods of the table are represented by correspondingly large turns of the spiral, and the largest turn of all carries the rare earth elements. Elements belonging to the same group in the periodic table lie in a vertical plane passing through the axis of the spiral.

J. C. S.

The arrangement of the periodic system of the elements. GEORG SCHALTENBRAND. *Z. anorg. allgem. Chem.* 115, 127-30(1921).—The elements are arranged in a kind of expanding family tree so that H, for instance, stands at the head of 2 series, the Li-K-Na and F-Cl-Br.

E. D. WILLIAMSON

New periodic classification of the elements. GIUSEPPE ODDO. Univ. Palermo. *Gazz. chim. ital.* 50, II, 213-45(1920).—This paper first appeared as a dissertation in 1914 but publication was delayed by military service. O. states a number of objections to Mendelyev's classification and has prepared a new one as follows: (1) beginning with H he has put Li under it. (2) He has arranged all the elements successively in the order of their increasing at. wts. (3) During this arrangement a new period was begun when an element with a prevalent metallic character is followed by one with a prevalent metalloidal character with which the new period is begun. In the 1st case owing to the lack of points of reference this was done so that Ne would come under He. This having been done the position of the rest was detd. by analogy. In this way the table falls apart naturally into 3 regions when divided up and down. O's discussion of the various periods will not be reviewed. After Bi a change takes place in the periodic system. If the system is compared to a river one now comes to the delta where the river branches. Fajans' classification (*C. A.* 7, 1669) is considered inadequate. In the main table Ra-Eu or niton, which Ramsay and Soddy found to be inert, is placed in the zero group. Since all the derivs. of niton are metallic they are placed in Period VII after Bi. A previous paper (*C. A.* 3, 2526) is briefly reviewed. A number of comments are made about breaks in the table. Thus U II it is thought will be found and placed in Group V below Ta. This classification provides for a pre-oxygen resembling Be in some respects. There are 14 metalloids and 60 metals or 90 including the radioactive elements. However, of the earth's crust 77% is metalloids of which about 75% is Si and O. There are several pages of discussion of valence. Other topics discussed are mol. wt. of the metals, zone of maximal density, atomic diam., m. p., thermal and elec. cond., zone of maximal resistance of metals to chem. attack, zone of maximal action of H<sub>2</sub>O on metals, zone of combination with N, zone of catalyzers, zone of acid metals, zone of sulfates, and zone of alums, many of which are discussed in connection with special tables.

E. J. WITZEMANN

Atoms and metals. ZAY JEFFRIES AND R. S. ARCHER. *Chem. Met. Eng.* 24, 507-12 (1921).—Following a summary outline of modern views of the ultimate constitution of matter, the authors discuss compds. between metals, concluding that most inter-metallic compds. seem to be secondary valence compds., whose compds. are detd. by geometrical considerations such as the sizes of the atoms and the directional properties of their force fields. As fluid metal cools the secondary valence groups in it increase in size and persistency of existence, until finally the thermal energy of the individual mols. is insufficient to free them from the attraction of other mols. and solidification takes place. "Solidification is identical with crystn., or the arrangement of atoms [of Sn] into positions fixed with relation to each other. The atoms remain in a state of vibration about their equil. positions, but have probably lost their energy of rotation. On further cooling the amplitude of vibration decreases, causing a contraction of the metal. As the kinetic energy of the atoms decreases and they become closer together, it requires a greater external force to sep. them—that is the cohesion increases." Some molten metal, in an unoriented or amorphous condition, remains between the crystals, which growing outward from nuclei meet each other along surfaces necessarily irregular. "On cooling to room temp. the motion of the atoms of the amorphous metal decreases to such an extent that the material, although possessing many of the structural features of a liquid, becomes rigid and is in effect a solid. However the atoms retain their ability to change their position with relation to one another, and the substance is, therefore, capable of flow. Transition from liquid to amorphous solid is gradual, and there is no

sharp f. p. and no heat of solidification; an amorphous solid is doubtless an undercooled liquid." The work of T. W. Richards on compressibility is also discussed.

JEROME ALEXANDER

**Nature of secondary valence. II. Partition coefficients.** HOMER W. SMITH. *J. Phys. Chem.* 25, 204-63 (1921); cf. *C. A.* 15, 1430.—An empirical method is described for detn. of properly corrected partition coefficients (P), of the distribution of a substance between 2 immiscible liquids; that is values eliminating the disturbing influences of dissociation, association, etc. The P's of a large number of org. acids and bases were detd. between water and xylene and between water and chloroform. On plotting the logs. of the P's against their respective *molecular volumes* there are obtained several series of parallel straight lines sepd. by definite and periodic distances. In any series of compds. having the same intrinsic intensity of secondary valence, the P is a simple logarithmic function of the mol. vol. Secondary valence is rhythmic in nature; the differences in secondary valence affect P by definite increases or decreases, and these unitary changes form octaves in which the 8th step is twice as large as any of the preceding seven. The relative position of a particular series in any octave may be indicated by its multiple number, or the number of times that the corresponding value of P, at a given vol., contains the highest common factor  $P_1$ , where  $P_1$  represents the value of P corresponding to the first series in the octave, at that vol. Thus the series run from 1 to 8 inclusive. Partition coeffs. are observed in series 1, 2, 3, 4 and 6; very rarely in 5, 7 or 8, which probably represent unstable conditions. "The differentiated nature of the octave, the peculiar distribution of compds. in the various series, and the principle of chem. homology which underlies this distribution by series, all indicate that the series numbers have some very fundamental significance, in that they appear to represent some characteristic condition of the mol. as regards intensity of secondary valence. . . . it seems imperative to assume that secondary valence is to be attributed to some part of the atom which is identical in its nature in, and common to, all atomic species." "The secondary valence associated with a particular atom in the combined state varies inversely as the vol. of the atom; the at. vol., as well as the secondary valence, depends upon the mode of chem. combination. . . . the intensity of secondary valence associated with a particular mol. species depends not only upon its chem. constitution, but also upon its environment." There is made the following deduction of fundamental importance in the theory of soln.: "In any liquid system, all the parts of which are in cohesive contact, there exist equilibrated intermol. forces involving all of the contained mols. A condition of compensation exists between these intermol. forces and the elec. mechanism in the mol. and its contained atoms in which they have their origin." (By secondary valence is meant what has been called by divers authors "unsaturation," "subsidiary," and "residual valences," etc.)

JEROME ALEXANDER

**Homochemical compounds.** P. P. VON VEMARN. *Kolloid-Z.* 28, 97-103 (1921); cf. *C. A.* 14, 3175.—A homochemical compd. is formed when like atoms (or at. groups) attract each other, as may happen during the cooling of a gaseous element or in the formation of a double salt like AgI.KI. Therefore, crystn. and the change gas  $\rightarrow$  fluid  $\rightarrow$  solid are essentially chem. Even in ordinary chem. compds. there are residual affinities; thus BaSO<sub>4</sub> may form homochem. compds. with Ba salts or with sulfates. By choosing proper conditions (solvents and temps.) homochem. combination may be produced between any two substances having a common atom or at. group. IAg.AgNO<sub>3</sub> melts at 95°, AgI at 526°, AgNO<sub>3</sub> at 209°, because in the homochem. compd. the attraction of the Ag atoms is opposed by the lesser attraction of the I and NO<sub>3</sub> group making it softer and more fusible. Crystals of AgI.KI float when extruded, while those of KI and AgI sink. A ppt. of BaSO<sub>4</sub> in aq. alc. and covered by a homochem. layer of MnSO<sub>4</sub> may be dispersed to colloidal state by the addition of a Ba salt. Homochem. compds.

may imitate chem. reactions (addition, decompn., double exchange) and serve to bridge the gap between "real chem." and "adsorption" compds. "From this standpoint there is no significance in the endless discussion between the supporters of the 'chemical' and the 'physical' theories." *Notes on the formation and stabilization of colloidal sols.* "True" soln. is not caused by ions, which are incident to the mutual action of solvent and solute; similarly "colloidal soln." depends on the mutual action of dispersion medium and dispersed phase, which may in special cases be accompanied by so-called ion reactions. In a dispersion medium in which ionization does not occur, there can be produced only *dilute* dispersions, whose *life* depends on their aggregation time. In such media stable concd. colloidal sols. can be made only by the aid of peptizers which result in *colloidal parasitism*. Thus a slight excess of Ba salt permits the formation of concd.  $\text{BaSO}_4$  sols in aq. alc. Such sols. resemble true sols. in many respects,  $\text{AgI}$  sol yielding visible crystals in about 3 months; they are not sensitive to electrolytes which do not affect the peptizer. [V. Lehner recently showed that  $\text{SeOCl}$  peptizes  $\text{BaSO}_4$ .—Auer.]

JEROME ALEXANDER

Research problems in colloid chemistry. WILDER D. BANCROFT. *J. Ind. Eng. Chem.* 13, 83-91, 153-8, 280-4, 346-51(1921).—The problems are grouped under the following heads: peptization, 8 problems; prepn. of colloids, 7; ultra filtration, 8; centrifugal force, 1; sp. vol., 1; viscosity, 1; color, 15; elec. properties, 6; stability, 12; gelatinous pptns., 4; jellies, 16; emulsions, 5; foam, 4; nonaq. colloids, 3; fog, 4; pptn. of solids, 6; gases in solids, 1; solids in solids, 4.

JEROME ALEXANDER

Elastic sulfur. THOMAS IREDALE. *Kolloid-Z.* 28, 126-7(1921).—On adding 70 g. concd.  $\text{HNO}_3$  to 150 g. of finely powdered  $\text{Na}_2\text{S}_2\text{O}_4$  in an evapg. dish copious fumes of  $\text{SO}_3$  and N oxides are evolved, and after washing with hot water there is obtained an irregular mass of elastic S quite similar to that obtained by von Weimarn by pouring molten S into liquid air. Transparency and elasticity are lost on standing 24 hrs.; also by cooling to  $0^\circ$ , in which case treatment with warm water will restore them. This sudden sepn. of S from a very concd. soln. is, as von Weimarn showed, favorable to gel formation, and elastic S may be regarded as the gel form of colloidal S.

JEROME ALEXANDER

The optical properties of dispersed systems. I. Color changes produced by light rays. FRITZ WEIGERT. *Kolloid-Z.* 28, 115-24(1921).—Largely a résumé of work previously published in *Mitt. Verh. d. Deutsch. physik. Ges.*, which discloses the surprising fact that linear polarized light causes certain media to exhibit dichroism and double refraction, the effect varying with the wave length of the light. The line of extinction in the artificial anisotropic films thus made from photo-chlorides, is the intersection between the planes of motion of the elec. and the magnetic vectors. With dyes the effect diminishes when the film stands a few days. Cyanine in gelatin films does not show it, but pinachrome and the other chief sensitizing colors do, as well as substituted fluoresceins, fuchsin, malachite green, methyl violet, methylene blue. Illustrations and curves are given showing the effects produced by red, yellow, blue and green light.

JEROME ALEXANDER

Coagulation and solution of silver bromide sols by ammonia. RUDOLF AUERBACH. *Kolloid-Z.* 28, 124-6(1921).—Just enough  $\text{NH}_3$  to satisfy the reversible equation  $\text{AgBr} + 2\text{NH}_3 \rightleftharpoons [\text{Ag}(\text{NH}_3)_2]\text{Br}$  does not cause either pptn. or re-solution within 5 min. With slight but increasing excess amts. of  $\text{NH}_3$  at first the coagulation speed transcends the solution speed; then the reverse. The turbidity curve thus shows a max.

JEROME ALEXANDER

The adsorption of formaldehyde by animal charcoal. W. MOELLER. *Kolloid-Z.* 28, 127-32(1921).—Animal charcoal adsorbs  $\text{HCHO}$  both from acid and neutral sols., the amt. depending upon the concn., and with acid sols. also on the vol. The adsorp-

tion balance is speedily reached in neutral soln., but was not reached in acid solns. even at the end of 8 days.

**Absorption of nitrogen and oxygen by charcoal.** R. E. WILSON. *Phys. Rev.* 16, 8-16(1920); *Science Abstr.* 23 A, 593(1920).—This paper is based on exptl. data by Lemon and Blodgett (*C. A.* 14, 835). Attention is called to the surprising fact hitherto not mentioned, that the number of mols. of O adsorbed to any given final pressure is almost exactly 1.30 times the number of mols. of N adsorbed to the same final pressure. The pressure vs. vol. adsorbed curve for pure O and for mixts. of O and N can, therefore, be very accurately calcd. from the results obtained with N alone. Furthermore, it is also possible to reproduce all the curves representing the rate of adsorption from the results obtained with N alone. By a mathematical treatment of the foregoing data it can be demonstrated that neither Langmuir's one-layer adsorption theory (which undoubtedly applies to that portion of the gas held with the greatest tenacity) nor the "capillary condensation theory" (which applies to loosely held liquid in capillaries of moderate size) is applicable to the intermediate range of pressures covered by the data of Lemon and Blodgett. Their results can, however, be explained on the basis of the following hypothesis: (1) the ratio of the mol. vol. of adsorbed N to that of adsorbed O is the same as for the free liquids (1.31 at  $-192^{\circ}$ ); (2) the gases are held in layers several mols. deep primarily by the attractive force of the charcoal surface; (3) the stray field around O and N mols. is substantially the same at any given distance.

E. J. C.

**Retention of gases by solid substances. I and II. Experiments on phosgene.** DOMENICO LO MONACO. *Arch. farm. sper.* 29, 3-47(1920).—The prepn., properties, and uses of  $\text{COCl}_2$  are described. The expts. made show that common materials, such as straw, hay, grass, soil, snow, fresh leaves, marine algae, sawdust, charcoal and cotton, are capable, especially if moist, of absorbing to some extent the asphyxiating gases used in warfare.

G. C. S.

**Electroendosmose and ion adsorption.** A. GYEMANT. *Kolloid-Z.* 28, 103-14(1921).—An electrokinetic method and app. for electroendosmotic detns. are described in detail. The membranes (several prepd. by Perrin's method of allowing suspended powders to settle) were collodion, kaolin, carbon, agar,  $\text{Fe}_2\text{O}_3$ , and filter paper. G. concludes that the charges underlying electroendosmosis are due to *ion adsorption*, which is dependent mainly on (1) different adsorbability of both ions in electrolytes together with replacement of ions by others of like charge, (2) the nature of the adsorbent. If the adsorbent is "acid" or "basic" it can at most discharge  $\text{OH}^-$  or  $\text{H}^+$  ions, but its charge cannot be reversed, although in certain cases tervalent ions can do it. If the adsorbent is an ampholyte, its charge depends upon the final concn. of  $\text{OH}^-$  or  $\text{H}^+$  ions. Collodion and agar are always negative; amorphous C is at present the only known non-reversible membrane. Analytical detn. of adsorbability is no criterion of charge-producing effect, for although  $\text{Na}_2\text{SO}_4$  charges C more than  $\text{NaCl}$ , analysis shows it to be less adsorbed.  $\text{Na}_2\text{SO}_4$  charges  $\text{Fe}_2\text{O}_3$  negatively, and  $\text{NaCl}$  positively, but analytically no definite adsorption is demonstrable.

JEROME ALEXANDER

**General and colloidal chemistry of gelatin solutions.** J. LOEB. *J. chim. phys.* 18, 283-97(1920); cf. *C. A.* 12, 1973, 1974, 2578.—Gelatin acts like an amphoteric electrolyte which in a concn. of  $\text{H}^+$  exceeding  $2 \times 10^{-4} N$  combines with anions forming salts of acid-gelatin and in a concn. below that combines with cations forming metallic gelatinates, while at the isoelec. point it combines with neither anion nor cation. These combinations follow stoichiometric proportions. Gelatin combines with univalent anions  $\text{H}_2\text{PO}_4^-$ , tartrate, citrate,  $\text{Cl}^-$  and  $\text{NO}_3^-$  and univalent cations, or with the bivalent anion,  $\text{SO}_4^{2-}$ , and bivalent cations, giving an osmotic pressure where it acts as a univalent ion twice as great as where it is bivalent. These results do not support the opinion that the stoichiometric and other laws of general chemistry are not applic-

able to colloids and call to mind the recent assertion of Langmuir (*C. A.* 12, 2152) that adsorption of gases on the surface of mica, glass and platinum is governed by the same forces of primary and secondary valence which det. the ordinary chem. reactions.

H. I. MATTIL

**Dependence of electroösmosis on the chemical properties of the diaphragm.** STANISLAW GLIKSLI. *Ans. Akad. Wiss. Krakau* 1917, (A), 102-28.—The fundamental assumption in the theory of electroösmosis is that the potential of the mobile layer of liquid,  $\Phi_1$ , differs from the potential,  $\Phi_0$ , of the layer attached to the wall of the diaphragm. A proportionality exists between the difference of potential ( $\Phi_1 - \Phi_0$ ) of the elec. double layer and the rate of electroösmosis or cataphoresis. The causes of the difference of potential and the mechanism of the phenomenon of the charge in the elec. double layer are discussed. All that is known is that the elec. double layer is considerably influenced by the addition of electrolytes, more particularly by H and multivalent ions and by the cations of the heavy metals and complex org. bases, and that the positively charged diaphragms are discharged by anions and the negatively charged ones by cations. The methods previously adopted have not permitted the use of moderately concd. electrolytes. G. has elaborated a method of observing and approx. measuring the velocity of electroösmosis which is particularly adapted to the estn. of the isoelec. point; it can be used with gels and powders, and permits the employment of approx. 0.5*N* solns. of electrolytes. The influence of H and hydroxyl ions on the elec. charge of the following inorg. gels has been examd.: silicic and tungstic acids, antimonc anhydride, stannic and titanac acids, Be oxide and hydroxide, Zn, Fe, Mg, and Ag oxides, and Ni(OH)<sub>2</sub>. With some of these, the concn. of H and hydroxyl ions at the isoelec. point is detd.; with others, the lower limit of its value is ascertained. With regard to the H-ion concn. at the isoelec. point, the substances examd. fall into 4 distinct groups: acids, acid ampholytes, basic ampholytes, and bases. The results of the investigation are examd. in the light of the present theories of the origin of the elec. charge in colloid particles.

J. C. S.

A critical study of the capillary-rise method of determining surface tension, with data for water, benzene, toluene, chloroform, carbon tetrachloride, ether and dimethylaniline. T. W. RICHARDS AND E. K. CARVER. *J. Am. Chem. Soc.* 43, 827-47 (1921).—The supposed finite contact-angle (reputed to be the weakest point in the capillary-rise method) does not exist with the liquids studied if the glass be properly cleaned and if evapn. of the liquid be prevented. The correction for the capillary rise in the wide tube calcd. by Rayleigh and Laplace has been experimentally verified. A preliminary experimental curve for the capillary rise in tubes that are not wide enough to come under these mathematical equations fits smoothly between the theoretical curve for very wide tubes and the theoretical curve for very narrow tubes. The method of calibrating tubes by weighing a mercury thread is not affected to an important extent by a film of air between the mercury and the glass, except perhaps in very fine capillaries. The disturbing effect of ellipticity in the cross-section of the capillary is indicated. The difference between capillary rise in air and *in vacuo* has been detd. with 6 liquids. In most cases the effect on the surface tension is less than 0.5%. The surface tensions of water, 72.73; benzene, 28.88; toluene, 28.43; ether, 16.96; CHCl<sub>3</sub>, 27.14; CCl<sub>4</sub>, 26.77; and PhNMe<sub>2</sub>, 36.56 at 20° have been measured in the presence of air. Removal of air caused increases in the surface tension as follows: water, +0.02; benzene, +0.14; CHCl<sub>3</sub>, +0.10; CCl<sub>4</sub>, +0.18; ether, +0.05; PhNMe<sub>2</sub>, +0.10. JAMES M. BELL

**The activity of water in sucrose solutions.** W. E. GARNER AND IRVING MASSON. Univ. Coll., London. *Phil. Mag.* 41, 484-6 (1921).—Jones and Lewis (*C. A.* 15, 201) have observed that with increasing concn. of sucrose in 0.1 *N* H<sub>2</sub>SO<sub>4</sub> there is a rise in the activity of H ion reaching values 60% in excess of that due to the total acid concn. A similar abnormality has been observed for the osmotic pressure. G. and M. present

tables showing that the two abnormality factors have nearly identical values at the same concn. of sucrose. Similar relations hold for glucose and levulose. The soly. of H and other gases is lowered in about the same ratio. The explanation offered is the virtual increase of H-ion concn. by withdrawal of part of the water by the solute.

S. C. LIND

The solubility of ethyl ether in solutions of sodium chloride. PERCY C. L. THORNE. John Cass Techn. Inst., London. *J. Chem. Soc.* 119, 262-8(1921).—Detns. of the soly. of  $\text{Et}_2\text{O}$  in aq. NaCl solns. at  $15^\circ$  and  $25^\circ$  show that the soly. decreases as the NaCl concn. increases. At  $25^\circ$  the amt. of  $\text{Et}_2\text{O}$  contained in 100 g. soln. (s) varies from 6.05 g. in pure  $\text{H}_2\text{O}$  to 0.31 g. in  $\text{H}_2\text{O}$  containing 25 g. NaCl per 100 g. soln. (c). Except in dil. solns. the log. of the wt. of  $\text{Et}_2\text{O}$  dissolved (s) is directly proportional to the NaCl concn. (c), i. e.,  $(1/c) \log (s_0/s) = k$ , where  $s_0$  is the soly. of ether in pure  $\text{H}_2\text{O}$ . This expression also holds for other systems. From the soly. data obtained, the mol. hydration of NaCl has been calcd. The number of mols. of  $\text{H}_2\text{O}$  per mol. NaCl decreases from 22.6 to 9.1 as the NaCl concn. increases from 4 to 25 g. per 100 g. of soln.

H. JERMAIN CREIGHTON

Application of the law of hydrolysis to the determination of molecular weights. H. COLIN AND A. CHAUDUN. *Compt. rend.* 172, 278-80(1921).—If solns. of sucrose, raffinose, or gentianose are treated with equal amts. of the enzyme sucrase, the rate of hydrolysis in each case is const. until the wt. of the sugar in the soln. has decreased to a certain value,  $a_1$ ,  $a_2$ , or  $a_3$ , resp., after which the rate of hydrolysis decreases until the end of the reaction. If the wt. of sugar initially present is equal to or less than  $a_1$ ,  $a_2$ , or  $a_3$  the rate of hydrolysis decreases throughout the expt. according to the law of Wilhelmy. It is found that the wts. of the sugars,  $a_1$ ,  $a_2$ , and  $a_3$ , which are capable of fixing the same amt. of enzyme are to each other as their mol. wts. Stated more generally, if one is given a group of substances of mol. wts.  $M_1$ ,  $M_2$ ,  $M_3$ , etc., all of which are hydrolyzed in an identical manner by the same ferment; and if one designates by  $a_1$ ,  $a_2$ ,  $a_3$ , etc., the wts. of these different substances capable of fixing equal quantities of the enzyme, then,  $a_1/M_1 = a_2/M_2 = a_3/M_3$ , etc. This law of hydrolysis permits the calcn. of the mol. wt. of all the members of the series in terms of any one of them.

C. H. LOMBARD

Catalytic action of copper salts on the oxidation of ferrous compounds by air. L. MAGUENNE AND E. DEMOUSSY. *Compt. rend.* 171, 65-9(1920).—Cu salts exert a marked catalytic effect on ferrous salts, favoring their oxidation in air. This effect is noticeable at extreme dilns. (1 in 100,000,000), and is sensitive to the least change in the reaction of the medium. It is apparently independent of the degree of ionization of the mixt. of Cu and ferrous salts, but is most marked with ferrous salts of weak acids, being apparently related to their degree of hydrolytic dissociation. J. C. S.

The mass effect in the entropy of solids and gases. WENDELL M. LATIMER. *J. Am. Chem. Soc.* 43, 818-26(1921).—Available data indicate that the entropy of large classes of substances at a given temp. and pressure approaches a limiting value, which is detd. solely by the mass and by the number of degrees of freedom of the mols. composing the substance, postulating a certain limiting value of the constraints in a solid below which the effect of the constraints upon the entropy of the solid is constant. The entropy of solids in which this condition is fulfilled is the sum of the entropies of the elements in the solid, which is given by the equation  $S_{298} = 3/2 R \ln \text{at. wt.} - 0.94$ . The entropies of 13 compds. available agree with the equation within an av. variation of 0.7 entropy unit, providing that the Kopp's law const. reaches a value of approx. 6. The data on 10 diatomic gases agree within the limits of the experimental error with the equation  $S_{298} = 3/2 R \ln \text{mol. wt.} + R/2 \ln \text{at. wt.}_1 + R/2 \ln \text{at. wt.}_2 + 30.22$ .

JEROME ALEXANDER

The principle of similitude and the entropy of polyatomic gases. RICHARD C. TOL-

MAN. *J. Am. Chem. Soc.* 43, 866-75(1921); cf. *C. A.* 14, 2110.—The author gives a brief introduction of his theory of similitude in a manner somewhat simpler than has been previously employed. Assuming that diatomic and polyatomic gases are composed of rigid particles having a definite mol. wt. and definite moment of inertia around their centers of gravity, T. derives, by means of the principle of similitude, equations for the entropy of monatomic, diatomic, and polyatomic gases. The equations thus derived agree with those of Sackur, Tetrode and Schames as to the manner in which the entropy depends on the temp., pressure, mol. wt., and moments of inertia of the mols. The equation for the entropy of a diatomic gas differs from that of Latimer. Values calcd. from T.'s equation and from Latimer's equation for the entropy of diatomic gases show about the same agreement with exptl. values within the rather small range for which such data are available. The data necessary for the case of polyatomic gases do not seem suitable for testing T.'s equation for the entropy of such gases.

EARL E. LEBMAN

Dynamical quantum state, Nernst's theorem and Gibbs' paradox. W. SCHOTTKY. *Physik. Z.* 22, 1-11(1921).—The author presupposes the first or Einstein form of the Planck quantum theory. According to this form of quantum theory a dynamical system can exist in only one of a series of perfectly definite different "quantum states." If we consider that the state of the system at any instant can be indicated by specifying the position of a point in a  $2n$  dimensional space, corresponding to the  $2n$  generalist coordinates and momenta for the system, each of these "quantum states" may be thought of as corresponding to a  $2n-1$  dimensional surface drawn in the  $2n$  dimensional space. If the representative point for a system is on the innermost of these surfaces, the system is said to be in the first quantum state, or in the  $n$ th quantum state if the representative point is on the  $n$ th surface. In the case of the hydrogen atom, this simple system is said to be in the first quantum state when the electron is in the innermost Bohr ring, in the second quantum state when the electron is in the second ring, etc. Schottky discusses, he believes for the first time, the Nernst heat theorem from the point of view of the internal "quantum state" of the mols. composing the system under discussion. He comes to the conclusion that the "chemical constant" occurring in the Nernst vapor pressure formula for a monatomic gas can only have its theoretical constant value if all the mols. of the gas are in the first quantum state. He also discusses the quantum state of mols. in polyatomic gases and in solids, and considers the Gibbs' paradox from the point of view of the interdiffusion of two samples of the same gas with their molecules in different "quantum states." R. C. T.

Theory of corresponding states and the quantum theory of gases and liquids. A. BYK. *Physik. Z.* 22, 15-20(1921).—This is a preliminary, entirely theoretical communication giving general relations from which many particular theorems such as that of "corresponding states" may be deduced.

E. D. WILLIAMSON

The molecular state of water vapor. ALAN W. C. MENZIES. *J. Am. Chem. Soc.* 43, 851-7(1921).—From a recalc. of the d. of satd. water vapor by the Clausius-Clapeyron equation, with modern data, it is shown that (1) the d. does not become less than the ideal value below  $30^\circ$ , which discredits the hypotheses of spontaneous ionization; (2) the excess d. at  $100^\circ$  computed from Regnault's data is about 100% too great. The vapor pressure of water at temps. averaging  $73^\circ$  detd. by the gas-current satn. method, yields a vapor density value for satd. water vapor less than 0.1% higher than the ideal value, while the Clapeyron equation value is 0.9% higher. This discrepancy requires investigation. By applying D. Berthelot's equation of state to the mean of these two results for  $73^\circ$ , "the numerical basis remaining from which to postulate polymerization of water vapor at this temp. is precisely zero." J. A.

The specific heat of saturated vapors and entropy-temperature diagrams of fluids. ALFRED W. PORTER. *Phil. Mag.* 40, 211-2(1920).—*J. A.* Ewing (*C. A.* 14, 3555) has



treated this subject in a recent paper of the same title. P. points out that Duhem (*Traité Élémentaire de Mécanique Chimique* II, p. 211) has given a thorough discussion of the subject and found that the curve for the sp. heat of a satd. vapor against temp. is an inverted unsymmetrical U, which may lie wholly in the negative region, but may lie higher up so as to cross into the positive region; if so, it crosses twice. The statement of Ewing that  $\text{SO}_2$  has no positive values is not in accord with the data of Mathias, according to which positive values occur in the temp. interval  $97.5^\circ$  to  $114^\circ$ . P. adds that while the difference between  $C_p$  (sp. heat of satd. vapor) and  $K_w$  (sp. heat of satd. liquid) is negligible at temps. remote from the critical temp., it tends toward infinity as the critical temp. is approached. The relation between the two is:

$$K_w = C_p - [T(d\sigma/ds)(dp/dT)]$$

The values for  $K_w$  obtained by Mathias are given for  $\text{SO}_2$  from  $-20^\circ$  to  $155.5^\circ$ . The increment of  $K_w$  is not a linear function of the temp. even in a region remote from the critical temp.

S. C. LIND

The heats of dilution and the specific heats of dilute solutions of nitric acid and of the hydroxides and chlorides and nitrates of lithium, sodium, potassium and cesium. THEODORE W. RICHARDS AND ALLAN W. ROWE. *J. Am. Chem. Soc.* 43, 770-96 (1921).—The tabulated heats of diln. of the substances mentioned in the title show that some are +, others—.  $\text{NaOH}$  and  $\text{HNO}_3$  show change of sign on progressive diln. The progression of values shows periodic relations, Na salts exhibiting eccentricities. The temp. coeffs. of the heats of diln. are tabulated in calories and in joules; they are all +, and from them the sp. heats of the various solns. are calcd., a plot making easy the detn. of values for intermediate solns. "The loss of heat capacity on dissolving salts in water is shown to be of the same order as the gain of heat capacity on neutralizing acids by alkalis, in such sense that the heat capacity is diminished by 50 to 100 mayers by such fraction of each gram ion as is formed from a g. mol. in solns. containing 100  $\text{H}_2\text{O}$ . Presumably the nature of the ion detn. the exact magnitude of this loss of heat capacity (1 mayer = heat capacity which is warmed  $1^\circ$  by 1 joule of energy). Heats of diln. and changes of heat capacity are shown to afford a possible partial clue to the extent of electrolytic dissociation. The temp. coeff. of the heat of neutralization of solns. containing 100  $\text{H}_2\text{O}$  is shown to vary somewhat with the nature of the alkali and of the acid, and to average about 51 calories or 213 joules per degree C. Therefore, the gain of heat capacity on neutralization is 213 mayers.

JEROME ALEXANDER

Specific heats. M. PADOA. *Atti accad. Lincei* 92, II, 198-202 (1920).—P. advances the view that the behavior of solids with respect to sp. heat should find its best interpretation in their chem. characters, these including the affinity. Application to this theme of the supposition, supported by P.'s exptl. data (*C. A.* 13, 1963, 3056; 14, 1921), that the binding of the atoms in crystals is due to chem. forces, and, therefore, to primary and secondary valencies, leads to the conclusion that the amplitude of the thermal movement of the atoms, and consequently also the heat content and its deriv. with respect to temp., that is, the sp. heat, should depend essentially on: (1) the solidity, (2) the directions, and (3) the number, of the linkings between the atoms. Since the stability and the mol. complexity increase in passing from simple to complex mols., it seems that a continually increasing affinity is rendered available for the construction of the cryst. edifice; confirmation of this is furnished by the fact that polymerides always melt at higher temps. than the corresponding compds. with simple mols. According to these considerations, both the solidity of the internal linkings of any single mol. and that of the external linkings uniting the various mols. of a chem. individual should tend to diminish the sp. heat. That such diminution of the sp. heat with polymerization does actually occur is shown by the results of P.'s measurements of the sp. heats of cyanamide, dicyanamide, and melamine; Ag cyanate and cyanurate; Na cyanate and cyanurate; levoglucosan, starch, and cellulose; cyanuric acid and cyamelide. For

instance, the value of the sp. heat for starch or cellulose is only about 1/2 of that for levoglucosan. From the mol. heat, a mean at. heat for each of the constituent atoms of a compd. may be calcd., and this at. heat, in contradiction of the law of Neumann and Kopp, decreases markedly as polymerization increases. The different values of the sp. heat for the isomeric cyanuric acid and cyanamide indicates, as was to be expected, that, other conditions being equal, the sp. heat varies with the arrangement of the valencies in a mol.

J. C. S.

Specific heat of liquids at constant volume. K. ZAKRZEWSKI. *Anz. Akad. Wiss. Krakau* 1917, (A), 86-101.—The values for  $(\partial p/\partial T)_v = \alpha/\mu$  are calcd. from the measurements of Seitz and Lechner (*C. A.* 10, 1953). While these values for EtOH at different temps. between 0° and -90° lie with sufficient accuracy on a straight line in the  $\partial p/\partial T$  vol. diagram, for Et<sub>2</sub>O and CS<sub>2</sub> they lie on different lines which are parallel to one another. Within this interval,  $\partial^2 p/\partial T^2 = 0$  for alc., and, therefore,  $\alpha_v$  is independent of the vol. For ether and CS<sub>2</sub>, on the other hand,  $(\partial p/\partial T)_v = A + Bv$ , in which  $A$  is a function of the temp., and hence  $\partial c_v^2/\partial v = T\partial^2 p/\partial T^2 = T\partial A/\partial T$ . Since the dependence of the sp. heats,  $c_p$ , of these liquids on temp. has been investigated in this region by Battelli, it is possible to calc.  $c_v$  (for a mean vol.,  $v$ ). The following values for this factor are thus obtained:

	0°.	-20°.	-30°.	-50°.	-70°.	-90°.
EtOH.....	—	—	0.406	0.386	0.370	0.358
Et <sub>2</sub> O.....	—	0.397	—	0.386	0.376	0.362
CS <sub>2</sub> .....	0.160	0.139	—	0.121	0.114	0.110

A bend such as would be expected from the Planck-Einstein formula is observed only in the case of ether when  $c_v^2$  is plotted against the temp; the opposite bend observed with alc. and CS<sub>2</sub> is attributed by Z. to the existence of complex mols. in these liquids.

J. C. S.

The system iodine-tellurium, study of vaporization. A. DAMIENS. *Compt. rend.* 172, 447-50(1921); cf. *C. A.* 15, 994.—From a study of the vaporization of I-Te mixts. under reduced pressure, it is detd. that the compd. TeI<sub>2</sub> does not exist. C. R. PARK

Determination of the boiling point with small quantities of compound. VICTOR ARREQUINS. *Ann. chim. anal. chim. appl.* 3, 40-9(1921).—This method is based on vapor pressure and is analogous to that of Schleirmacher, (*Ber.* 24, 944(1891) and *Les méthodes de la chimie organique* by Weyl, 313). A glass tube (A) 80 mm. long and 9 mm. diam., with 1 end closed, contains another tube (B) 52 mm. long and 5 mm. diam. which has a closed bulb blown at 1 end, of such diam. that when B is inserted in A the bulb leaves a space 0.5-1 mm. between it and the inner wall of A. *Procedure:* Introduce into A about 0.8 mm. depth of Hg and fill B nearly to the top with Hg, leaving space for 1 drop of the liquid to be detd. Turn over B so that the drop rises to the top of the bulb enlargement, and place B down in A so that the open end of B rests on the bottom of A below the Hg surface. Fill the space in A above the bulb of B with glass beads and cover the open end of A with a cap. If a dry compd. with low m. p. is detd., this may be dropped into the bulb of B, melted, solidified, and Hg added as before. Place the app. with a thermometer in a medium where it can be heated very slowly and uniformly. The Hg column in B will descend, the Hg in A will ascend, and when the level of the two is the same, the b. p. of the compd. is read. Great care must be taken to heat the surrounding medium very slowly. After detg. the b. p. in this way, the vapor pressure of the Hg inside of B must be allowed for. Data for this are found in the Landolt-Börnstein tables. For liquids boiling below 210-20°, the Hg pressure may be neglected in practical work.

C. C. DAVIS

Contribution to the knowledge of boiling-point ratios. R. LORENZ AND W. HERZ. *Z. anorg. allgem. Chem.* 115, 100-4(1921).—For twenty-nine substances, for which data

are given in Landolt-Börnstein's tables, the ratio of the b. p. to the critical temp. approximates to 0.64. If the point where the vapor pressure is 0.02 of the critical pressure is substituted for the b. p. the same is true and in this case the divergence from 0.64 is less than  $\pm 0.02$  for 22 cases as against 16 in the case of the b. p. The ratio of the temp. at which a liquid has a d. 2.5 times the critical d. to the critical temp. has the approx. value 0.74, the error being less than  $\pm 0.02$  for 18 out of 29 cases examd.

E. D. WILLIAMSON.

Some new methods for the determination of the vapor pressure of salt hydrates. ROBERT E. WILSON. *J. Am. Chem. Soc.* 43, 704-25(1921).—Vapor pressure detns. by both static and dynamic methods present the following difficulties: slowness of approach to equil., equil. approach from one side only, adsorbed gases on the salt hydrate, no satisfactory confining liquid. The indirect method of shaking with an anhydrous solvent allows more rapid approach to equil. and also allows approach to equil. from both sides. The solvents previously used are  $\text{Et}_2\text{O}$  and  $\text{EtOH}$ , both of which have disadvantages. Isoamyl alc. is preferred because it dissolves a moderate but not a large amt. of water (9.8% at 25°). Several rapid methods of detg. the water content of the isoamyl alc. (after it had been equilibrated with the hydrate) were tried and abandoned. The reaction of  $\text{Mg}_3\text{N}_2$  with water yielding  $\text{NH}_3$  gives good results but is tedious and difficult. The reaction of Ba amylate with water yielding  $\text{Ba(OH)}_2$  presented two difficulties: the low soly. and the instability of the amylate. The appearance of cloudiness on the addition of water to an unknown mixt. was not accurate enough. The addition of solns. of  $\text{CoCl}_2$  in amyl alc. to the unknown mixt. caused colors varying from blue to pink with rising water content. The degree of accuracy of the colorimetric comparisons was not considered sufficient. Finally, certain cond. methods were tested. The addition of a known amt. of a soln. of  $\text{CoCl}_2$  in amyl alc. gave solns. whose cond. varied 10-fold between pure alc. and water-satd. alc. The values of these conductivities are, however, not large enough to mask the disturbing influences of the contaminations arising from the soln. of small quantities of the salt whose hydrate is under investigation. Satn. of the aq. amyl alc. with KCNS, however, gave high sp. conductances; thereby the errors due to contamination were eliminated. It was not possible to work with solns. above 3% water, since a second liquid phase appeared. Solns. of higher water content can readily be analyzed by adding to them a known wt. of anhydrous alc. before satn. with KCNS. In order to establish the vapor-pressure-water-content curve for isoamyl alc. solns., it was necessary to det. with especial accuracy the aqueous-vapor pressures of a few hydrated salts. For this purpose the salts were placed in a small balance inside a desiccator equipped with a fan and stirrer and containing  $\text{H}_2\text{SO}_4$  soln., the strength of which was varied until the concn. was found at which the salt neither gained nor lost in wt. This method was found to be very satisfactory for salts which gained or lost water with fair rapidity. The vapor pressures of 5 pairs of salt hydrates were found to be within the limits indicated (all at 25°):  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} \cdot 3\text{H}_2\text{O}$  7.80  $\pm$  0.03 mm.,  $\text{BaCl}_2 \cdot 2\text{H}_2\text{O} \cdot \text{H}_2\text{O}$  5.8  $\pm$  0.1 mm.,  $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O} \cdot 7\text{H}_2\text{O}$  19.13  $\pm$  0.01 mm.,  $\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O} \cdot 2\text{H}_2\text{O}$  14.51  $\pm$  0.04 mm.,  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} \cdot \text{H}_2\text{O}$  19.22  $\pm$  0.02 mm.

JAMES M. BELL

Determination of the vapor pressure of salt hydrates by a distribution-conductivity method. ARTHUR A. NOYES AND LEON R. WESTBROOK. *J. Am. Chem. Soc.* 43, 726-34 (1921).—The distribution-conductance method outlined by Wilson (see preceding abstract) has been perfected by detg. the conductance of isoamyl alc. solns. of known water content, satd. with KCNS and by detg. the water content of isoamyl alc. solns. which had been brought into equil. with pairs of hydrates of accurately known vapor pressure.

JAMES M. BELL

Study of binary and ternary mixtures found in the manufacture of synthetic acetic acid. PAUL PASCAL, DUFUY, ERO AND GARNIER. *Bull. soc. chim.* 29, 9-21(1921).—

A study of (1) the method of fractionation of the mixt.  $\text{H}_2\text{O}$ -HOAc-HAc in the direct oxidation of a mixt. of HOAc and HAc, and (2) the consts. of the mixt.  $\text{H}_2\text{O}$ -HOAc- $\text{H}_2\text{SO}_4$  in the electrolytic oxidation of  $\text{H}_2\text{SO}_4$  solns. of HAc or paraldehyde. (1) Values given by Oudemans for binary mixts. at  $0^\circ$ ,  $15^\circ$  and  $40^\circ$  were used to interpolate the  $d_{40}$ , the equation being linear. These were combined on a triangle and the compn. of ternary mixts. was obtained for any d. Fractionation of  $\text{H}_2\text{O}$ -HAc,  $\text{H}_2\text{O}$ -HOAc, and HAc-HOAc was done at 760-2 mm. pressure, and the % compn. of both the liquid and the vapor in HAc, HOAc, and HOAc, resp., detd. The values of the  $\text{H}_2\text{O}$ -HOAc mixt. agreed with those of Sorel (*Compt. rend.* 122, 946(1896)). By combining the 3 binary mixts. by triangulation data are given for the compn. of  $\text{H}_2\text{O}$ -HAc-HOAc mixt. for any b. p. (2) Values for the binary mixt.  $\text{H}_2\text{O}$ -HOAc appeared under (1), and for  $\text{H}_2\text{O}$ - $\text{H}_2\text{SO}_4$  have been published by Burt, (*J. Chem. Soc.* 85, 1339(1904)) and by Lunge. By combining the values triangularly, data are given for the compn. of the ternary mixt.  $\text{H}_2\text{O}$ -HOAc- $\text{H}_2\text{SO}_4$  for any b. p. This method can be applied to a mixt. of  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ .

C. C. DAVIS

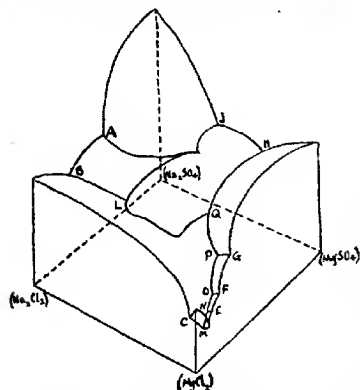
The phenomena presented by allotropic organic substances in contact with a solvent. H. VRIESBOOM. Univ. Amsterdam. *Rec. trav. chim.* 40, 1-29 (1921).—On account of many diagrams and curves this paper can not be abstracted fully. The author's résumé of the principal results follows: (1) In the theoretical part the deduction of a relation existing between the solubilities of 2 pseudo constituents in a given solvent and the concns. is given. The formula of van't Hoff which expresses this relation is a particular case of a general formula deduced by Smits (*C. A.* 10, 2425). (2) In submitting this formula to the test of expt. V. used monobenzoylempbor (A), which shows keto-enol tautomerism. In detg. the isotherms of ternary soly. V. found that the method of analysis of Meyer gave insufficiently accurate results. V. developed a new method of analysis by making use of the optical activity of A. By the titration method of Meyer V. detd. 5 isotherm diagrams corresponding to the solvents EtOH, AcOH,  $\text{Me}_2\text{CO}$ ,  $\text{Et}_2\text{O}$  and PhMe. The results do not conform very well with the formula. By using the 2nd method of analysis V. detd. the isotherm diagrams for 3 solvents—EtOH,  $\text{Me}_2\text{CO}$  and PhMe at 3 temps. The isotherms thus obtained deviate from the preceding. The concordance with the formula of Smits was satisfactory. As the form of the isotherms deviates more strongly from the ideal form, the application of van't Hoff's formula gives inexact results.

E. J. WITZEMANN

Thermal analysis of the system thallium nitrate: thallium nitrite. VITTORIO CUTTICA. *Atti accad. Lincei* 29, II, 89-92(1920); cf. Rolla and Belladen, *C. A.* 14, 1498.—The thermal behavior of fused mixts. of Tl nitrate and nitrite excludes the formation of complexes. The two salts form an uninterrupted series of mixed crystals, the transformation in the solid state corresponding with Roozeboom's type II. J. C. S.

Double ternary systems with miscibility gaps in the liquid and solid states. I and II. C. MAZZERU. *Atti accad. Lincei* 29, II, 150-3, 194-8(1920).—I. M. considers first the case of the double ternary system, in which only 1 binary system, corresponding with 1 side of the square, exhibits liquid and solid miscibility gaps with eutectics, the other 3 pairs forming continuous series of mixed crystals, and the surface  $\tau$  being below  $\tau_3$ . Diagrams of the system are shown. When 2 of the binary systems present solid and liquid miscibility gaps and eutectics, various cases occur: either these binary systems give rise to 2 pairs of gaps which have no mutual effect, in which event the condition of affairs is similar to that in which only 1 of the binary systems shows gaps; or the solid gaps alone, or else both solid and liquid gaps, fuse to a single gap. II. Attention is given to a double ternary system in which 3 of the binary systems exhibit solid and liquid miscibility gaps and eutectics; in this case there appear in the system 2 compd. gaps represented by 2 singular triangles, one of 3 liquids and one of 3 solids. The case of 4 miscibility gaps in the system is also considered. J. C. S.

Equilibrium of reciprocal salt pairs, sodium chloride-magnesium sulfate and sodium sulfate-magnesium chloride, at 25°C. SHIRO TAKEGAMI. *J. Tokyo Chem. Soc.* 41, 831-68 (1920).— $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ ,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ , and  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$  were



prepd. by repeated crystn. from the best materials obtainable in the market. NaCl was purified from its satd. soln. by pptn. with HCl gas. Mg was estd. as phosphate,  $\text{SO}_4$  as Ba salt, Ag as chloride. Results of expts. on (1) soly. of each of the 4 salts, (2) equil. of 2 salts having a common ion, and (3) equil. of reciprocal salt pairs are recorded in 17 tables and 8 graphs, which show that at the equil. of NaCl- $\text{MgSO}_4$  and  $\text{Na}_2\text{SO}_4$ - $\text{MgCl}_2$  at 25° there exist 9 varieties in the solid phase, viz.,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ , NaCl, astrakanite,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$ ,  $\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{MgSO}_4 \cdot 4\text{H}_2\text{O}$ , and  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ . The comps. of the satd.

solns. at the points of equil. are given in the following table. The compn. of the liquid phase can be calcd. from the formula  $100 m \frac{112.0 a \text{Na}_2(100-a) \text{Mg}}{b \text{Cl}_2(100-b) \text{SO}_4}$ .

S. TASIRO

Points.	Solid phase.	a.	b.	m.
	NaCl	100	100	18.02
	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	0	0	18.31
	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$	100	0	28.51
	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	0	100	9.41
B	NaCl; $\text{Na}_2\text{SO}_4$	100	80.40	15.96
A	$\text{Na}_2\text{SO}_4$ ; $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$	100	51.31	18.03
C	NaCl; $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	1.08	100	9.32
H	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ; Astrakanite	32.72	0	13.69
J	Astrakanite; $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$	50.14	0	13.97
G	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ; $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$	50.14	0	12.08
F	$\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$ ; $\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$	0	86.81	12.08
E	$\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$ ; $\text{MgSO}_4 \cdot 4\text{H}_2\text{O}$	0	91.10	10.15
D	$\text{MgSO}_4 \cdot 4\text{H}_2\text{O}$ ; $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	0	93.58	9.11
K	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ ; $\text{Na}_2\text{SO}_4$ ; Astrakanite	57.95	13.88	13.66
L	$\text{Na}_2\text{SO}_4$ ; NaCl; Astrakanite	73.38	70.66	15.06
Q	NaCl; Astrakanite; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	37.97	49.71	13.96
P	NaCl; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ; $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$	3.77	87.04	11.92
O	NaCl; $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$ ; $\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$	0.63	91.12	10.03
N	NaCl; $\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$ ; $\text{MgSO}_4 \cdot 4\text{H}_2\text{O}$	0.25	93.7	9.6
M	NaCl; $\text{MgSO}_4 \cdot 4\text{H}_2\text{O}$ ; $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	0.24	93.77	9.27

The electrochemical behavior of mixed crystals of gold with copper and silver. G. TAMMANN. *Z. allgem. anorg. Chem.* 112, 233-43 (1920).—In previous papers (C. A. 14,

668, 671) it has been shown that there is a limiting compn. for Au-Cu and Au-Ag alloys, such that, when the Au content exceeds this limit, the alloys are not attacked by different chem. reagents. The limiting compn. was correlated with the probable distribution of the two kinds of atom on a face-centered cubic lattice in the cryst. structure of the alloy. The electrochem. properties of these alloys have now been investigated. When Cu-Au alloys are used as anode in an electrolytic cell, with a Cu cathode and Cu sulfate or nitrate as electrolyte, the limiting compn. is about 0.27 to 0.30 mol. of Au; with a smaller proportion of Au than this, Cu is dissolved from the anode. With Au-Ag alloys as anode, using  $\text{H}_2\text{SO}_4$  or  $\text{HNO}_3$  as electrolyte, the limiting compn. is 0.35 to 0.40 mol. of Au. Similar limits were found when the decompn. potentials of such cells were measured. On the other hand, to obtain a persistent polarization effect of 1.4 volts in the case of Au-Cu and 0.73 volt for Au-Ag, the proportion of Au to Ag or Cu must not fall below 0.5 mol. The normal limiting compn. for weak oxidizing agents, such as  $\text{H}_2\text{O}_2$ , in acid or alk. soln. is about 0.25 mol. of Au; in the case of anodic O, therefore, this normal limit is exceeded. The same is true of anodic S, produced by the electrolysis of  $\text{Na}_2\text{S}$ , the limit in this case being more than 0.50 mol. of Au. Discussing these observations from the point of view of the space-lattice theory, T. points out that in an alloy contg. 0.25 mol. of Au, that is, 1 atom of Au to 3 of Cu, in the face-centered cubic lattice there will not be in any cube face plane any two Cu atoms the distance of which from one another corresponds with the minimum translation in the lattice. The alloy would, therefore, be protected against attack by any agent which needs two atoms of Cu. If the agent can attack the Cu, on the outer planes, but the Au atoms retain their positions, then, if the agent cannot penetrate the structure, the alloy is still resistant. The limiting compn. for strong anodic polarization of the alloys, 0.5 mol. Au, is the same as the limiting compn. in Au-Pd alloys for H soly. These facts may be correlated with the presence in the structure of alloys contg. 0.5 mol. of Au or less of cube edges or diagonals formed exclusively of Cu or Ag or Pd atoms. J. C. S.

The resistance of solutions of copper sulfate in glycerol. A. GILMOUR. Univ. of Belfast. *Phil. Mag.* 41, 544-8(1921).—A soln. of  $\text{CuSO}_4$  in glycerol has been used as a source of high resistance of small inductance. For this reason detns. were made of its sp. resistance at various dilns. from 0.001 to 0.258 g. of  $\text{CuSO}_4$  per g. glycerol. The cond.-concn. curve is a smooth one for the lower concns. but shows a series of striking maxima and minima at the higher ones. No special means was employed to dry or purify the glycerol used as solvent. S. C. LIND

Solutions of metals in non-metallic solvents. VI. The conductance of the alkali metals in liquid ammonia. CHARLES A. KRAUS. *J. Am. Chem. Soc.* 43, 749-70(1921).—In dil. solns. of Na, K, and Li in liquid ammonia the conductance approaches a limiting value according to a curve which is of the same general form as that of ordinary electrolytes. At a concn. of approx. 0.05 *N* the equiv. conductance has a minimum value, after which it begins to increase rapidly with increasing concn. This increase is particularly pronounced in the neighborhood of 1 *N*, corresponding with the increase in the relative speed of the negative carrier as deduced from the results of measurements of the e. m. f. of concn. cells. At still higher concns. the conductance approaches that of metallic conductors. At approx. 2 *N* a soln. of Na in liquid  $\text{NH}_3$  has an equiv. conductance of approx. 83,000 and a sp. conductance of  $0.0164 \times 10^4$ . A satd. soln. of Na in liquid  $\text{NH}_3$  has a sp. conductance approx. half that of mercury at 0°. It appears that the solns. of the metals in liquid  $\text{NH}_3$  form the connecting link between electrolytic and metallic conductors. It has been shown that the conduction process in the case of these solns. is an ionic one. There is nothing to distinguish the more concd. solns. from actual metallic substances. It may be concluded that the process of conduction in the case of the ordinary metals is effected by means of the same negative carrier. Since the carrier is negatively charged and has subatomic dimensions it is identical

with the negative electron as it appears in radioactive and other phenomena.

JAMES M. BELL

The conductivity of dilute alloys free from mixed crystals. H. C. BURGER. *Physik. Z.* 22, 28-29(1921); cf. *C. A.* 14, 143.—A reply to criticism by K. Lichteneker.

E. D. WILLIAMSON

Electrical conduction in solid crystallized compounds. II. Transport and migration of the ions in simple solid electrolytes. C. TUBANDT. *Z. anorg. allgem. Chem.* 115, 105-26(1921); cf. *C. A.* 14, 3352.—A small current was passed through cylinders of AgI, AgBr, AgCl, Ag<sub>2</sub>S, PbCl<sub>2</sub>, PbF<sub>2</sub> and CuS. The cylinders were in three parts and the end parts were weighed so as to det., if possible, the transport numbers of the ions. A typical result with AgI is as follows: Silver deposited in voltameter in circuit 0.5872, silver lost from silver anode pressing against the cylinder 0.5874, wt. of cylinder next cathode before and after 4.3336 and 4.3338, wt. of middle cylinder before and after 2.6374 and 2.6374, wt. of cylinder next anode 4.0083 and 4.0081. Clearly Faraday's law holds and the silver lost by the anode is balanced by that which migrates along the cylinder, all the current being carried by the positive ions. Similar results are obtained for the other cases except that in the case of the lead chloride and fluoride it is the anion which migrates.

E. D. WILLIAMSON

The limiting value ( $\lambda_{\infty}$ ) of the molecular conductivity in aqueous and non-aqueous solutions. P. WALDEN. *Z. anorg. allgem. Chem.* 115, 49-86(1921).—W. covers a very large range of data in testing the various formulas which have been proposed for calcg.  $\lambda_{\infty}$  from some exptly. detd.  $\lambda_p$ . There is little to choose between  $\lambda_{\infty} = \lambda_p + (a/v^{0.6})$  and  $\lambda_{\infty} = \lambda_p + (b/v^{0.6})$ , but the latter seems slightly to be preferred. W. uses it in the form  $\lambda_{\infty} = (\lambda_{p1} \cdot v_1^{0.6} - \lambda_{p2} \cdot v_2^{0.6}) / (v_2^{0.6} - v_1^{0.6})$ . The form of the term  $d_p$  in the formula  $\lambda_{\infty} = \lambda_p + d_p$  is also treated and it is found satisfactorily represented by  $d_p = 51.4 / \epsilon \eta v^{0.6}$  where  $\epsilon$  and  $\eta$  are resp. the dielec. const. and viscosity of the pure solvent. The different formulas give values of  $\lambda_{\infty}$  in about the following proportions:  $\lambda_{\infty, p^{0.6}} = 1.012 \lambda_{\infty, \text{Kohlr.}} = 1.0077 \lambda_{\infty, p^{0.5}}$ .

E. D. WILLIAMSON

Reactivity and conductance of benzene solutions. H. P. CADY and E. J. BALDWIN. *J. Am. Chem. Soc.* 43, 646-51(1921).—According to Kahlenberg (*J. Phys. Chem.* 6, 1(1902)), solns. of Cu, Co and Ni oleates, dried over Na and P<sub>2</sub>O<sub>5</sub>, show no conductivity, but when treated with dry HCl give ppts., with still no evidence of conductivity. Similar work by ALLEN (*Kansas Univ., Sci. Bull.* 1915) and by Cady and Lichtenwalter (*C. A.* 8, 606) gave results of a different nature. Subsequently Koenig (*C. A.* 8, 2352) inferred that the method employed by C. and L. in prep. the Na salts used, viz., the addition of a slight excess of alkali to the acid, caused the formation of basic salts, which would account for the observed conductivity on adding HCl. C. and B. have now repeated the work of C. and L. but prepd. the salts with an excess of acid instead of base: their results accord with those of C. and L. Carefully dried solns. of Cu oleate and stearate, Ba erucate and Ag melissate in C<sub>6</sub>H<sub>6</sub> were found to show a measurable conductivity, which increased when dry HCl was passed through the soln. The addition of SnCl<sub>4</sub> in C<sub>6</sub>H<sub>6</sub> to Cu stearate in C<sub>6</sub>H<sub>6</sub> caused a momentary increase in conductivity, followed by a pptn. with an accompanying decrease in conductivity; the SnCl<sub>4</sub> soln. itself showed practically no conductivity. Its addition to Cu oleate in C<sub>6</sub>H<sub>6</sub> caused a momentary increase in conductivity followed by a decrease to somewhat less than the original reading. Oleic acid in dry C<sub>6</sub>H<sub>6</sub>, after drying over CuSO<sub>4</sub>, showed practically no conductivity and addition of HCl caused only a slight increase; on treatment with SnCl<sub>4</sub> in C<sub>6</sub>H<sub>6</sub>, however, the increase in conductivity was so great that no reading could be made with the instruments used. The conductivity shown in these cases is considered sufficient to account for the reactivity of the solns. on the basis of the dissociation theory.

C. A. ROULLER

**Silver protein.** A. GAWALOWSKI. *Osterr. Chem. Zig.* 24, 17(1921).—Reference is made to an earlier publication on this subject (cf. *Pharm. Centralk.*, 1875, No. 38, 321-3), treating specifically of a coating or tarnish formed on a Ag spoon. Analysis indicated the presence of an albuminate of Ag, having the compn.,  $C_{24}H_{44}N_{10}O_{10}S$  (protein radical) in combination with Ag. W. O. E.

**Use of ethylene chloride in the laboratory.** ALEX. WACKER. *Chem. Zig.* 45, 266 (1920).—Ethylene chloride is a good substitute in many cases for ether in analytical work or org. synthesis. It is especially suitable for use where ether cannot be used on account of its extreme inflammability. J. L. WILBY

**Evaporation of aqua ammonia** (AUERBACH, MILLBRADY) 18. The pressure limit of autoxidation considered as a particular case of the lower limit of explosion (JOURSEN) 24. Adsorption of alkali chlorides by animal charcoal (HARTLESEN) 11A. The carbon arc lamp with heated electrodes (MATHIESSEN) 4.

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### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

**The internal constitution of the stars.** A. S. EDDINGTON. *Rept. Brit. Assoc. Advanc. Sci.* 1920, 34-49.—An address. Giant stars are made up of gases so diffuse that they obey the gas laws perfectly. With contraction the temp. rises to a max. dependent on the mass and then follows gradual lowering of temp. due to loss of radiant energy and the stars become dwarfs. About half the energy of the giant stars is present as radiant energy, which exerts a pressure opposing gravity. All giant stars have nearly the same opacity, probably owing to a scattering effect, so that they all have about the same luminosity. The importance of expl. detn. of the star diameters, is pointed out and the role of subatomic energy in the life history of the stars is emphasized.

F. O. A.

**Helium and hydrogen models.** EDWIN C. KEMBLER. *Science* 52, 581-3(1920).—Closely approx. expressions for the energy of the electrons in Langmuir's model of the He atom (*C. A.* 14, 2580; 15, 463) are derived from the Wilson-Sommerfeld quantum



conditions. Numerical evaluations using L.'s data do not give the observed ionization potential of He. F. O. A.

Isotopes and atomic weights. F. W. ASTRON. *Proc. Roy. Inst. Gt. Britain*, Preprint (Feb. 11, 1921), 11 pp.; *Engineering* 111, 203-5(1921); cf. *C. A.* 14, 3578; 15, 335.—An address. In discussing the synthesis of the atoms Prout's "protyle" is applied to the electron while the H nucleus or positive electron is called the "proton." *Isobares* are defined as atoms having the same mass but different chem. properties. Beside the isobares among radioactive elements there is evidence of their existence among Br, Kr and Te. F. O. A.

The properties of protactinium. II. Life period and abundance in uranium minerals. OTTO HAHN AND LISE MEITNER. *Ber.* 54 B, 69-77(1921).—See *C. A.* 15, 795.

NORRIS F. HALL.

Evolution of heat during the transformation of radium. B. H. HERSZFINKIEL AND L. WERTENSTRIN. Warsaw. *J. Phys. Radium* 1, 143-5(1920).—Radium B contg. 7-14% of the equil. amt. of RaC was pptd. with  $\text{PbSO}_4$  from a soln. contg. Bi. The ppt. was rapidly introduced into a special calorimeter, and the evolution of heat was studied at the same time that the growth of the X-ray activity due to RaC was measured. An apparent lag in heat production is shown to be due to the app., and since the corrected heat production and activity curves are superposable, the authors conclude that RaB in equil. with RaC produces at most 2% of the heat due to the latter. The heat of this  $\beta$ -transformation is due, therefore, exclusively to the energy of the emitted  $\beta$  particles. The observed magnitude of the heat evolution agrees with the calcd. value.

NORRIS F. HALL.

Atmospheric electricity. LXI. Measurement of the radium emanation content of the air at Innsbruck. RELY ZLATAROVIC. *Wien Ans.* 1920, 75.—By the use of charcoal and petroleum as absorbents, an ionization vessel which previously showed a satn. current,  $i_1$ , was completely freed from emanation; the satn. current,  $i_2$ , which was now measured, was found to be const. The difference,  $i_1 - i_2$ , is applied to the calcn. of the emanation content, and, as a mean of 49 observations, gives the value  $433 \times 10^{-11}$  curie/cc., the extreme values being 1110 and 40. Dependence on meteorological factors could only be so far recognized in that rainy periods correspond with lower emanation values. J. C. S.

Constancy of the ratio of actinium to uranium in natural minerals. STEFAN MEYER AND VIKTOR F. HESS. *Sitzb. Akad. Wiss. Wien* 128, (2a), 909-24(1919).—It has been assumed for a long time that the Act series is derived by indirect degradation of the U-Ra series. If this is the case, the ratio of Act to Ur or Ra must be const. in all U minerals. Few, and not very concordant, observations have been recorded, chiefly by Boltwood, in this connection. The authors have, therefore, examd. exhaustively the reputed constancy of the ratio Act : U, and have used U minerals which differ as widely as possible from one another, both in origin and compn., and include the following: amorphous Joachimsthal pitchblende, cryst. pitchblende from Morogoro, bröggerite, and two different specimens of thorianite. Quantities of the minerals corresponding with 30 g. of U were dissolved in concd.  $\text{HNO}_3$ , and the solns. were diluted with water to 1 l. and brought into rotating flasks; the Ra emanation was first removed in a const. current of air, and, immediately afterwards, the active ppt. of Act (with a portion of Th ppt. if present) was collected on a negatively charged plate. The value of Act B + Act C could be readily derived from the known half life-periods for Act B + Act C and Th B + Th C. The observed activities are not great, but the results of repeated measurements are quite concordant. The ratio Act : U is found to be const. in all minerals, thus giving a sure support for the hypothesis that the Act series is genetically related to U. J. C. S.

Thorium and uranium content of certain minerals; the gradual transformation of

**thorium B—thorium C.** STEFAN MEYER. *Sitzb. Akad. Wiss. Wien* 128, (2a), 897-908 (1919).—The estimation of Th or U in U ores containing very little Th, or in Th ores with a very small U content, cannot be effected by the usual methods; it is, however, relatively easy to est. minimal amts. of U by the proportional Ra content, and of Th through its active ppts. In a specimen of monazite sand the ratio of Th to U was 83 : 1, an extreme value, which is not commonly observed. A specimen of Joachimsthal pitch-blende contained  $6.64 \times 10^{-4}$  g. of Th isotopes (Th+Io) for 1 g. of U, or  $3.33 \times 10^{-7}$  g. of Ra. The Th content of a cryst. Morogoro U mineral, the U content of which was already known, was estd. in the following manner. The amt. of Th-B obtained under definite conditions from a known wt. of the mineral was compared with the amt. produced under identical conditions from a mineral of known Th content. The Morogoro mineral was thus found to contain 0.53% of Th and 74.5% of U. The amt. of Th is so great that the equiv. of the Th-Io from the mineral can scarcely be distinguished from that of Th itself. In an appendix, M. gives tables showing the effect of differing exposure in Th emanation on the activity of active Th ppts. J. C. S.

**Measurements on two radioactive springs in Brambach.** P. LUDWIG. *Freiberg. Physik. Z.* 22, 121-3 (1921).—Variations in pptn. and the radioactivity, abundance of flow, and temp. of two springs were followed during the months of August to October, 1920. The abundance and radioactivity both rose after a considerable increase in rainfall, in one spring immediately,—in the other with a lag of about a week. This behavior is probably due to the fact that when the underground water is running rapidly (after rain) its contained emanation has less time to decay than during the slow flow of drouths. There is also more loss of emanation from escaping  $\text{CO}_2$  bubbles during slow flow. NORRIS F. HALL.

**The visibility of the track of  $\alpha$ -particles in phosphorescent zinc sulfide.** H. HERZFINKEL and L. WERTENSTEIN. *Warsaw. J. Phys. Radium* 1, 145 (1920).— $\alpha$ -Particles were caused to strike a very thin screen of ZnS at grazing incidence in the field of an immersion microscope. The tracks are series of bright points unless the ZnS is very fine, when they look like shooting stars. Their length agrees with the calcd. range. NORRIS F. HALL.

**Specific heats and subatomic vibrations.** FRANZ SKAUFY. *Berlin. Z. Physik.* 4, 100-104 (1921).—The fact that sp. heats, even when the deviations from the law of Dulong and Petit are large, are additive and hence purely atomic is inconsistent with the view that this deviation is measured by a quantum effect proportional to the frequency of a vibration which is conditioned by the forces of chem. binding. The assumption is suggested that vibrations that det. the energy content of a solid are vibrations between parts of the atom and some consequences of this are briefly discussed. F. C. HOYR.

**Thermodynamics of the uncommon states in vapor spaces. (Thermal ionization and thermal luminosity.)** I. W. SCHOTTKY. *Würzburg. Ann. Physik.* 62, 113-55 (1920).—The author endeavors to develop a general thermodynamics for the phenomena of electron emission, ionization, and the emission of light, paying special attention to the relations between free energy and p. d. Part I contains a discussion of the free energy of the solid phase, the work of ionization, the galvanic and voltaic p. d., and the free energy of the vapor phase. The free energy of an electron or ion with respect to the solid phase depends upon the p. d. between the solid and the point where the particle is. The galvanic p. d. between the contact surfaces of two metals is given by the difference of the natural free energies of the electrons in the two metals. The voltaic p. d. between 2 boundary surfaces outside 2 conductors is given by the total free energy of the electrons in the 2 conductors with respect to the chosen boundaries. The work of ionization,  $j$ , is given by the equation  $I^- + I^+ = I^\infty + j$ , where the  $I$ 's are the mol. heats of vaporization of electrons, positive ions, and neutral atoms. E. N. BUNTING

**Mobilities of radioactive ions in the Bunsen flame.** HERBERT SCHÖNBORN. *Z. Physik* 4, 118-30(1921).—Using the method of H. A. Wilson (*Phil. Mag.* 192, 499(1899)), S. finds for the mobility of recoil atoms of Th C' in the Bunsen flame 300 to 400 cm./sec. per volt./cm., depending on the temp. These atoms carry a positive charge. There is a critical summary of related work.

F. C. HOYT

**The ionization of atmospheric neon.** F. HORTON AND MISS A. C. DAVIES. *Rept. Brit. Assoc. Advanc. Sci.* 1920, 352-3; cf. *C. A.* 15, 336.—An abstract. None of the critical velocities (11.8 and 17.8 v. for radiation and 16.7, 20.0 and 22.8 v. for ionization) can be attributed to the displacement of a second electron from an already ionized atom. They are probably due to the displacement of electrons differently situated in the atom, indicating lack of symmetry in the arrangement of the outer electrons of Ne around the nucleus. In the spectrum sometimes the lines of the principal series come in at 20.0 v. while the lines of the first and second subordinate series type come in only at 22.8 v. The gas used was considered to be very pure.

F. O. A.

**Investigations with regard to the induced charge from electrical fields on the Ebert ion counter.** HARALD NORINDER. Meteorological Inst. Uppsala. *Arkiv. Mat. Astron. Fysik* 15, No. 2, 19 pp.(1920).—The effect of a uniform as well as the earth's variable electrostatic field was observed on the Ebert ion counter at different wind velocities. With large fields and low wind velocity the error may be considerable, especially for the decrease in negative charge in a positive field. The results with and without a shield are compared and formulas are derived for the approx. calcn. of the necessary corrections.

F. O. A.

**Observations on atoms excited by electron impact.** J. FRANCK AND W. GROTRIAN. *Z. Physik* 4, 89-99(1921).—The excitation of an atom by electron impact consists in the removal of an electron from a stationary orbit to one with a higher quantum number. Ordinarily the configuration thus formed has a life of only about  $10^{-8}$  sec., but when the return with light emission is ruled out by a selection principle it may become stabilized by picking up a second electron, forming an outer shell similar to He. Two of the ions thus formed may unite to form a mol. compd. like  $H_2$ . This hypothesis accounts for the production of band spectra in He. The phosphorescent phenomena in Hg vapor can also be accounted for qualitatively by the formation in this way of a Hg compd. that breaks down when subject to collisions with neutral atoms.

F. C. HOYT

**The luminosity of mercury vapor distilled from the arc in vacuo.** NORMAN H. RICKER. *Rice Inst. Phys. Rev.* 17, 195-226(1921).—Considerable evidence is offered in support of Child's contention (*C. A.* 8, 2522) that the afterglow in Hg distd. from an arc is due to a recombination of positive and negative ions. Strutt's work (*C. A.* 12, 1359) was repeated and confirmed and it is shown to be not inconsistent with Child's conclusion (cf. *C. A.* 13, 929). R. obtained enhanced luminosity by heating the Hg cathode. The luminous vapor passed through a hollow Ni anode into a heated tube containing 2 or more grids. On charging one of the grids positively a current flow as great as 1 amp. at 5 v. could be obtained. The reddish glow which first filled the tube diminished on both sides of the grid up to a grid voltage of 2, after which it was replaced by a bluish glow. The change in color was found to be caused merely by a relative change in intensity of certain lines in the Hg spectrum. On charging a grid negatively the luminosity upstream is not diminished even at 300 v. and downstream but slightly. The current is a small part of an amp. and never reaches satn.; so that quenching is far from complete. A jet of Hg vapor sent into the luminous stream serves merely to dil. the light. The vapor velocity was detd. by applying a high-frequency voltage to one grid with a stroboscopic wheel so that the luminosity appeared in puffs which could be accurately observed. The velocity was 3740 cm. per sec. Then from the rate of distn. the vapor density was calcd. and shown to be essentially const. along the tube. The

rate of decay of luminosity was observed with a Nutting polarization photometer and compared with formulas derived on three assumptions; (1) that the positive ions emit light spontaneously and not continuously; (2) that the light is produced during recombination of positive and negative ions, and (3) that light is continuously emitted by positive ions. Formula 2 fitted the observed decay better than 1, each having but one arbitrary const.; but formula 3 with 2 arbitrary const. would fit almost any set of data; so it is impossible to decide in its case. All the facts observed support Child's claim that the light is caused by recombination of ions.

F. O. A.

Scattering and absorption of hard X-rays in the lightest elements. T. E. AURÉN. *Medd. K. Vetenskapsakad. Nobelinst* 4, No. 5, 12 pp.—The previous work (C. A. 13, 928) was repeated with bundles of X-rays with even shorter average wave lengths. The values for the atomic coeff. of absorption relative to water for the lighter atoms agreed fairly well with the previous results. If the absorption by H is due to a scattering effect from its one electron the absorption by C with 6 electrons and by N with 7 electrons is practically all a scattering effect. But with O, having 8 electrons outside the nucleus, there first appears good evidence of true absorption other than scattering. Also in *Phil. Mag.* 41, 733-43(1921).

F. O. A.

Scattering of X-rays in water. F. DESSADER and F. VIERHILLER. *Z. Physik* 4, 131-145(1921).—By immersing films in a large water bath, with the addition of a photographic developer, and radiating the whole with a pyramidal beam of X-rays, D. and V. det. the distribution of intensity, which is here largely dependent on scattering. The measurements are for beams whose vols. are in the ratio 1 to 1/4 to 1/10 to 1/200 and for voltages of 160, 180 and 200 kv. The intensity of scattered radiation increases in a given direction with (1) voltage, (2) increasing vol. up to a certain limit (3) increasing depth to a limit (4) approach to the central ray. The decrease in intensity from the center out is uniform for different voltages and depths. The pure absorption coeff. of water is given by the intensity decrease at the greatest depths, where scattering has no effect. At 160 kv. the coeff. is 0.09, at 180 0.079, and at 200 0.069. From measurements of the total absorption coeff. the scattering coeff. by difference is found to be 0.074, independently of voltage.

F. C. HOYT

Fine structure of X-ray spectra. ADOLF SMERKAL. *Z. Physik* 4, 28-45(1921).—The Kossel-Sommerfeld theory of the structure of X-ray spectra can be extended by two assumptions; (1) three quantum integers are necessary for the quantizing of the "shells" as a whole, and (2) all the electrons of a shell are not necessarily energetically equivalent. The main reason for assuming (1) is that, excluding one of the integers from being zero, it will give one absorption limit ("energy level") for the K-series, three for the L-series and 6 for the M-series. This is in agreement with expt. for K and L and in M there are at least five with a possibility for a sixth. Assumption (2) would be of use in explaining the fine structure of K $\alpha$  and the many weak lines of the L-series.

F. C. HOYT

Precision measurements in the L-series of the heavy metals. DIRK COSTER. LUND. *Z. Physik* 4, 178-88(1921).—The measurements of Hjalmar (C. A. 15, 1101) are continued from W to U, although the accuracy is slightly less. Besides the lines found in the light elements there appears in W, Pt, Tl, Pb and Bi a pair of weak lines having the characteristic L doublet difference. The measurements show Sommerfeld's A-doublets ( $\beta_3 - \beta_4$  and  $\gamma_1 - \gamma_2$ ) do not have accurately the same frequency difference in the same element and hence are not real doublets. A weak companion of  $\beta_4$  is observed in W, Pt, Au and Tl.

F. C. HOYT

Investigations of photoelectric effects in salt solutions. II. Hydrogen peroxide as a factor in the change in electromotive force caused by illumination of salt solutions. TORSTEN SWENSSON. *Arkiv. Kemi Mineral. Geol.* 7, No. 25, 7 pp.; cf. C. A. 14, 2677.—Decomposition of H<sub>2</sub>O<sub>2</sub> when subjected to ultraviolet light is more rapid in water than in

$\text{NiSO}_4$  soln. In the dark a very slow decompn. was noted in the  $\text{NiSO}_4$  soln. but none in water soln. Preliminary illumination of the  $\text{NiSO}_4$  soln. had no effect. In water after 18 hours of illumination  $\text{TiSO}_4$  reagent showed a trace of  $\text{H}_2\text{O}_2$  remaining, but 30 hours more left no detectable trace. Thiele (*C. A.* 2, 952) claimed that  $\text{H}_2\text{O}_2$  was formed during illumination of water but S. was unable to obtain any detectable amounts even on illuminating for 2 hours with a quartz-Hg lamp. Addition of  $\text{H}_2\text{O}_2$  in amts. varying from 0.14 to about 500 mg. per liter increased the e. m. f. of a soln. of  $\text{NiSO}_4$  or  $\text{K}_2\text{SO}_4$  against Pt by 2.2-50 mv., while illumination during 20 min. decreased the potential by 85 mv. The probability that  $\text{H}_2\text{O}_2$  was the cause of the decrease noted is, therefore, very small. The temp. coeff. of the  $\text{NiSO}_4$  element was found to be +0.0025 v., indicating that the observed photo-elec. effect was not due to temp. increase.

F. O. ANDEREGG

Photoelectric conductivity of phosphorescent zinc sulfide. B. GUDDEN AND R. POML. Göttingen. *Z. Physik* 4, 206-10(1921); cf. *C. A.* 15, 17.—It is shown the photoelec. cond. of ZnS containing Cu changes in the same way with wave length of the exciting light as does the phosphorescence. The curves show clearly the  $d_1$  and  $d_2$  maxima of Lenard.

F. C. HOVR

High temperatures and emission from gasses. G. M. J. MCKAY. *Science* 52, 637 (1920).—No evidence of emission lines from Hg, N, H or A when heated to  $3200^\circ \text{K}$ . by means of a W filament was obtained. The potential gradient along the wires varied from 1.5 v. per cm. in Hg to 15 v. per cm. in H. Hg shows only an absorption line at  $\lambda 2536$ . It is suggested that the results of A. S. King (*C. A.* 15, 801) and Hemsalech (*C. A.* 15, 20) were due to chem. action of some kind.

F. O. A.

Influence of dissociation on the absorption of potassium permanganate. EMILIO ADINOLFI. *Atti accad. Lincei* 29, II, 87-9(1920).—The absorption spectrum of  $\text{KMnO}_4$  is not influenced by the extent to which the salt is dissociated.

J. C. S.

The influence of radiant energy on the so-called exchange or displacement reactions (BAUDISCH) 6.

ABRAHAM, M.: *Theorie der Elektrizität*. Vol. 2. *Elektromagnetische Theorie der Strahlung*. 4th Ed. Leipzig: B. G. Teubner. 394 pp. M. 22, bound M. 25.60.

GLANFRANCESCHI, M. G.: *La fisica dei corpuscoli*. 2nd Ed. Rome: Fratelli Bocca. 264 pp. 15 lire. For review see *Rev. sci.* 59, 126(1921).

RINNE, FR.: *Die Kristalle als Vorbilder des fein baulichen Wesens der Materie*. Berlin: Gebr. Bornträger. 102 pp. For review see *Deut.-Zuckerind.* 46, 208(1921).

ROUGIER, LOUIS: *Philosophy and the New Physics*. Authorized translation from the author's corrected text of "La Materialisation de l'Energie" by Morton Masius. Philadelphia: P. Blakiston's Son and Co. 159 pp. \$1.75.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

The electrochemical industry in Germany. K. ARNDT. *Elektrotechn. Z.* 42, 264 (1921).—In 1917 Germany produced about 300,000 tons of  $\text{CaC}_2$ . Up to the 1st of May 1919, the Piesteritz plant near Wittenberg turned out 10,000 tons  $\text{CaC}_2$  per month. After that the industry became demoralized.  $\text{CaCN}_2$  was made in large quantities but the farmers did not take to it readily. During the summer of 1918 the Al production amounted to 1000 tons per month; by the beginning of 1919 many of the plants closed down. The electrochemist has succeeded in producing pure  $\text{Al}_2\text{O}_3$  from German clays.

C. G. F.

**Notes on large electric steel furnaces.** GEORGES VIE. *Age de fer* 37, 923-8(1921).—Notes on the method of connecting the electrodes, cross section of the furnace, regulation of the current, voltage and electrodes, fitting the electrodes into the furnace, and construction of the transformers. A. P.-C.

**Process of M. T. Levoz for the direct reduction of iron ore in the manufacture of iron and steel.** A. S. *Russ. min. met. chim.* 54, 29-30(1921).—The process is carried on in 3 stages in a specially designed elec. furnace. In the first stage the oxides of Fe, Mn and Si in the charge are reduced. In the second a portion of the  $Al_2O_3$  introduced with the charge is reduced, giving an iron free from C and containing Si, Ca, and Al. In the third stage the impurities are oxidized to a fusible slag, the heat of reaction carrying the metal to a very high temp. Cryolite is added to facilitate the reactions and the sepn. of the slag. J. S. LAIRD

**Electric furnaces for non-ferrous alloys.** H. W. GILBERT. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—A splendid detailed review of all the elec. furnaces now in operation in the United States melting brass and other nonferrous metals. Tables show the type, user, alloy, capacity, kw. rating, and total kw. of each furnace. There are 318 furnaces in 144 different plants of a total capacity of 193 tons of alloy per single heat, using 42,350 total kw. G. discusses briefly the construction, advantages and disadvantages of each type. Also in *Foundry* 49, 468-76(1921). C. G. F.

**Electrodynamic forces in electric furnaces.** CARL HERING. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—A number of recently discovered mechanical forces is described which are of elec. origin and which may be made use of, or may be detrimental, in some types of elec. furnaces, chiefly those in which the heat developing resistor is a liquid, which responds to these forces more readily than a solid. Such forces may be usefully applied to cause the liquid metal, such as brass, to flow very rapidly through the heat-developing resistor, thereby enabling the furnace to be forced, and to cause a strong upward circulation in an adjoining bath, by which the metal is refined of suspended impurities and made homogeneous. After referring briefly to the formerly described "pinch effect," a description is given of the "stretch effect" and of the "corner effect," known also as the "motor effect." (See also *Chem. Met. Eng.* 24, 817 (1921).) C. G. F.

**Refractories for bottom-connected electric furnaces.** F. W. BROOKER. *Iron Age* 106, 1316(1920).—Successful operation of elec. furnaces having a conductive bottom depends upon: correct application of the current, the use of good double-burned dolomite and a good pitch or tar, and good operators. The transformer connected directly to the bottom is designed to carry a heavier current than that carried by each electrode, which necessitates the bottom transformer having such a kw.-amp. capacity and a secondary voltage that when the top electrodes carry equal currents there is a perfect balance on the primary side. These features insure carriage of all current given to the furnace, no elec. trouble from the deep holes formed during melting, and long life of furnace linings. A good pitch consists of the residue from coal tar distn. up to 250°. Quick "coming on" of the conductivity is effected by designing the furnace and putting in the bottom in such a way that all the excess tar will quickly drain away.

W. H. BOYNTON

**Marsh electrolytic cells for chlorine, caustic soda and hydrogen.** C. W. MARSH. *Trans. Am. Electrochem. Soc.* 39, preprint(1921); cf. *C. A.* 15, 1106.—The cells are like storage batteries, compact and of small bulk. Batteries of 50 to 100 amperes and operating at rated capacities average 3 v. with a power efficiency of 70%. The current density is 400 amp. per sq. meter of cathode. A battery of 15 cells of 100 amp. capacity takes a floor space of 0.6 m.  $\times$  3.6 m. Each cell measures 16.5 cm.  $\times$  39 cm. long  $\times$  55 cm. high; it produces 1.8 kg. Cl per hr., 2.0 kg. NaOH and 0.05 kg. H per hr. Each cell absorbs about 3.9 v. For water and sewage purification, batteries of 100 amp. to 300

amp. are recommended. Under normal conditions the batteries operate 6 mos. and longer without interruption for the purpose of changing the asbestos paper diaphragms. The graphite anodes last 2 yrs. without change. With power at 2 cents per kw.-hr., Cl will cost about 8 cts. per lb. The only labor required, other than the elec. control of the current by hand according to the output required, is making the pure brine. The NaCl is dissolved in  $H_2O$  and the Fe and other impurities are pptd. by the addition of NaOH or  $Na_2CO_3$ . For long operating periods, 6 mos. or more, the ampere efficiency will amount to approx. 90%, at power efficiencies of about 60%. C. G. F.

The apparent irreversibility of the calomel electrode. A. W. LAUBENGAYER. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—In 1890 Paschen pointed out that a Hg anode polarizes much more strongly in HCl than in  $H_2SO_4$ . He attributed this difference to the formation of a coherent film of calomel. L. made up a series of chloride and sulfate cells. He used Pt as cathode throughout. The anode was Hg in some of the cells and Pt in others. Amp.-volt curves were plotted. It was found that in the KCl and HCl solns., with Hg anode and a potential drop of 6 v., the current is less than 1 milliamp. as against 10 milliamp. for 2 v. with a Pt anode, and as against 4 and 10 milliamp. with 2.5 v. for a Hg anode in a sulfate soln. Results indicate that the apparent irreversibility of the calomel electrode is not real but is due to the formation on the surface of the Hg anode of a strongly adsorbed film of HgCl of high elec. resistance. Why HgCl should behave so differently from  $Hg_2SO_4$  was not established. Also in *J. Phys. Chem.* 25, 232-6(1921). C. G. F.

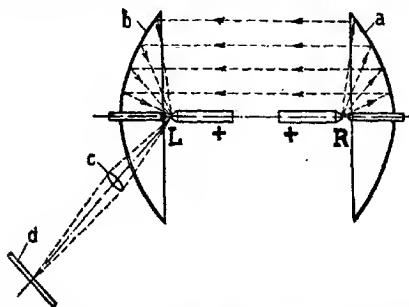
The care of nickel plating baths. EUGEN WERNER. *Elektrochem. Z.* 27, 25-7(1921).—For the deposition of Ni on Fe, W. recommends 100 l.  $H_2O$ , 3.5 kg.  $NiSO_4$ , 1 kg.  $Na_2SO_4$  (anhyd.), 2.5 kg. Na citrate;  $6.7^\circ B\acute{e}$ ; spacing between electrodes, 15 to 20 cm., 2 to 2.5 volts, c.d. 0.2 amp. per sq. dm., 2 to 2.5 hrs. For rapid plating Ni on Fe: 100 l.  $H_2O$ , 8.5 kg.  $NiSO_4$ , 2.3 kg.  $Na_2SO_4$  (anhyd.), 5.0 kg. Na citrate,  $7.5^\circ B\acute{e}$ , 3 to 3.5 volts, 0.5 amp. per sq. dm., 1 to 1.25 hrs. Temp. of bath must be kept above  $10^\circ$  as otherwise salts begin to crystallize out;  $18-23^\circ$  is recommended. Na citrate is better for heavy deposits, boric acid for light deposits. The citrate produces a tough deposit which shows no tendency to crack and peel. However, "satisfactory deposits of more than 1 mm. in thickness are impossible." For plating brass, W. recommends: 100 l.  $H_2O$ , 4.5 kg.  $NiSO_4$ , 1 kg.  $Na_2SO_4$ , 0.8 kg. boric acid; or 100 l.  $H_2O$ , 5 kg.  $NiNH_4SO_4$ , 1 kg.  $(NH_4)_2SO_4$ , 1 kg. boric acid. "Peeling of Ni deposits is always due to insufficient cyanide in the Cu flashing bath." (No mention made of H.) Too much acid may cause peeling; addition of  $Na_2CO_3$  will offset it. C. G. F.

Electrolytic iron. ANON. *Elektrotechn. Z.* 42, 138(1921).—A review. The German plant is not operating. A small plant is in operation in Sweden. C. G. F.

Protective coating for aluminium. L. VON GROTHUSS. *Metall u. Erz* 17, 39-40 (1920).—Al sheets are given a protective coating by making them the cathodes in a bath, maintained at  $60-5^\circ$ , consisting of a soln. of a sulfo-compd. of Mo. Zn sheets form the anodes. After a short time the Al becomes coated with a dark brown to black deposit which withstands rolling, bending, etc. Sheets thus protected are unaffected by tap- or sea-water. J. S. C. I.

The carbon arc lamp with heated electrodes. W. MATHIESSEN. *Elektrotechn. Z.* 42, 375-6(1921).—The light and heat of the arc  $R$  was reflected and focussed onto the arc  $L$ . The reflector  $b$  had a hole permitting the light to pass through a lens  $c$  onto a white screen  $d$ . The positive C electrode was 22 mm. in diam., the negative 15 mm. The current of the arc  $R$  was 20 to 40 amp. at 50 v. Without any current applied to the arc  $L$  its temp. rose to  $1100^\circ$  (detd. by imbedded thermo-couple) as compared with  $4000^\circ$  of the arc  $R$ . When the arc  $L$  was in operation its potential dropped from 49 v. to 45 v. on account of the radiation from  $R$ . If in place of the pure C electrode an impregnated positive (Excello yellow, No. 104) was used the drop in voltage

due to radiation from arc *R* was but 2 to 3 v. instead of 4. This indicated that ionization of the gas about *L* was less effected in the CaF<sub>2</sub> arc. Optical pyrometric measurements of *L* with *R* operating at 20 amp.: arc *L* at 20 amp. 3699° abs.; at 30 amp., 3866°; at 40 amp., 3983°. The corresponding temp. of *L* with arc *R* cut off: 3899°; 3988°; 4031°. That is, the radiation from *R* caused a decided drop in temp. of arc *L*



owing, no doubt, to higher degree of ionization in consequence of this added energy. Arc *L* (30 amp.) grew in length from an original 3.5 mm. to 5.0 mm. upon closing circuit on *R*; the increase in candle power of *L* due to the radiation effect from *R* was about 20%, which is attributed partly to the increase in the size of the luminous crater, and partly to increase in brightness of the crater. C. G. F.

**The Pintsch neon glow lamp.** FRITZ SCHROETER. *Elektrotechn. Z.* 42, 121-5(1921).—The light of this elec. lamp is due to glow discharge through Ne gas, or Ne + Hg gas, or through He gas. One of the characteristic differences between this glow lamp and an incandescent C or W lamp is the extremely low current, a fraction of a milliamp. being required to produce the light effect. The resistance of the Ne glow lamp decreases with increasing current. In other words, Ohm's law which applies to the W filament lamp, does not apply to the Ne glow lamp. In the case of the d. c. Ne glow lamp, the resistance at 20 milli-amp. is about 10,000 ohms. In the fig. shown the Fe spiral is cathode and the Fe disk, anode. (Cf. C. A. 13, 1419, 2815; 14, 3021.) This same lamp, except that besides the Ne a little Hg vapor is present, will also operate on a. c. With d. c. only the cathode is glowing; with a. c. both electrodes glow. For signalling purposes a 5 watt Ne lamp has been found most serviceable. The voltage of the lamps is 220. The lamp has found many practical applications. In series with a 100,000 ohm Se cell, 220 v. circuit, the Ne lamp will remain dark as long as the Se cell is not exposed to light rays. As the resistance of the Se cell drops (through illumination) the current through the Ne glow lamp increases and the glow increases in intensity. The Ne lamp connected in series with the Röntgen tube will indicate by its brightness the amount of current passing through the tube. Numerous other applications are described in detail. 21 illus. C. G. F.



**Cost and efficiency of lamps and lighting in Germany in 1920.** L. BLOCH. *Elektrotechn. Z.* 42, 174-200(1921).—A detailed review. C. G. F.

**The term "potential," its conception and history.** F. EMDE. *Elektrotechn. Z.* 42, 169-73(1921). C. G. F.

**Colin G. Fink.** ANON. *Elec. World* 77, 961(1921); 1 illus.—Brief biography. R. J. C.



Cottrell electrical precipitator at plant of American Acid Co. (KRE, VIETS) 18.  
Effect of copper and silver salts on the corrosion of iron by acids (WATTS, KNAPP) 2.  
Electric furnace refractories (PIKE) 19. Platinum substitutes (ARNDT) 1.

**Treating gases and vapors electrically; electric furnaces.** ELEKTROSYNTHESIS GRS. Brit. 158,250, Jan. 17, 1921. In carrying out electrochem. gas reactions, a stream of an absorbent liquid such as  $H_2O$  or a soln. of acid or alkali forms one or both electrodes or an auxiliary electrode. When electrolytic decompn. of the liquid would be prejudicial, alternating currents of frequency higher than 500 cycles per second, say 1000-3000 cycles, may be employed. An arc or a silent or spark discharge may be produced. The liquid may flow through a vertical arcing electrode and fall as a rapid succession of drops on to a flat dish of liquid forming the second electrode, an intermittent arc being produced. By increasing the arc gap and the rapidity of flow, a flaming arc burning around the liquid jet may be obtained. A suitable app. is specified.

**Reducing aluminium ores.** C. G. COLLINS. U. S. 1,372,483, Mar. 22. Al is reduced from ores such as  $Al_2O_3$  by mixing the ore with C, sawdust, alkali and NaCl and heating with exclusion of air. The oxalate formed facilitates the reduction.

**Obtaining phosphorus from natural phosphates.** F. S. WASHBURN. U. S. 1,373,471, Apr. 5. A mixt. of phosphatic and siliceous materials, in run of mine sizes, e. g., phosphate rock and  $SiO_2$ , is sintered to a porous mass and this mass is charged into an elec. furnace together with C and heated to evolve P.

**Electrical resistance element.** T. F. BAUV and F. T. COPK. U. S. 1,372,330, Mar. 22. An elec. resistance element adapted for use in elec. furnaces is formed of a hollow outer portion of low cond., such as carborundum, the interior of which is filled with a material such as pieces of C of relatively high cond.

**Carbon electrodes.** I. SZARVASY. Brit. 158,890, Feb. 7, 1921. In the manuf. of C-electrodes, natural gas or methane is subjected to a cracking treatment in such a manner as to give a mixt. of soot and tar which is then molded and burned in the usual way. The decompn. of the gas is controlled by regulating the temp., the flow of gas and duration of the heat treatment which is performed in an externally heated chamber or tube. When the highest possible yield of C is obtained and the amt. of tar is correspondingly low, additional tar or the like may be added.

**Fixation of atmospheric nitrogen.** G. T. SOUTHGATE. U. S. 1,373,639, Apr. 5. In fixing atm. N, the gases are passed through porous electrodes simultaneously with the passage of an elec. arc. between the electrodes. The electrodes may be formed of willow charcoal.

**Cleaning gases.** F. R. MCGEG and A. F. NEBBIT. U. S. 1,372,710, Mar. 29. Gas, e. g., producer gas from which dust and tar is to be removed, is passed through a hollow electrode within which it is given a whirling motion to throw impurities to the outer portion of the column centrifugally while a corona discharge is maintained within the electrode to facilitate purification of the central core of gas, which is separately drawn off. Cf. C. A. 15, 133.

**Electroplating the inner surface of metal vessels.** C. H. CHANDLER. U. S. 1,373,488, Apr. 5. In electrodeposition of a lining in a torpedo flask or similar container, the flask is made cathode and an anode of solder is used with an electrolyte containing Pb hydrofluosilicate from which is built up a lining alloy of Pb and Sn of a progressively increasing content of Sn, which makes for economy and firmness of the deposit.

**Renovating nickel-faced polishing plates.** L. SCHULTZ. U. S. 1,373,837, Apr. 5. The worn faces of Ni-faced press polishing plates are Ni-plated from a soln. containing  $Na_2SO_4$  and single and double Ni salts such as  $NiSO_4$  and  $NiNH_4$  sulfate and the plated surface is polished.

**Electroplating the interior of an insulator.** SOC. MATERIALE ELETTRO TRAZIONE.

Brit. 158,909, Feb. 10, 1921. In copper-plating the interior of an insulator, such for instance as is used in elec. traction, the insulator forms the only receptacle for the electrolyte. To maintain the concn. of the liquid and to remove hubbles, there is used a sol. anode which is rotated or reciprocated or both. A suitable construction is specified.

**Electrolytic vat.** H. LOBB. U. S. 1,372,176, Mar. 22. A vat adapted for use in the electrolytic manuf. of Cl is formed of a glazed pottery vessel cased in wood with a packing of asphalt between the pottery vessel and the casing.

**Electrolytic cell for producing oxygen and hydrogen from water.** I. H. LEVIN. U. S. 1,372,442, Mar. 22.

**Electrolytic cell for producing chlorine and caustic soda.** E. A. and H. I. ALLEN. U. S. 1,373,394, Apr. 5. The cell has a cylindrical cathode, a cylindrical diaphragm covering the inner face of the cathode and a cylindrical tubular anode within the cathode and diaphragm.

**Electrode for recovering metals from solutions.** U. C. TAINTON. U. S. 1,373,273, Mar. 29. Paper sheets coated with comminuted conducting material such as graphite are used as electrodes in electro-pptn. of metals from solns., *e. g.*, in the recovery of Au.

**Electrodes for electrolysis of copper sulfate solutions.** CHILB EXPLORATION CO. Brit. 157,871, May 17, 1920. An electrode suitable for use as an anode in  $\text{CuSO}_4$  solns. is made of an alloy containing Co and Si. There may also be added a metal, such as Mn, facilitating disengagement of the electrolytic O, and a hardening metal such as Cr, W, Mo, or U. Sufficient C may be added to produce a slight formation of graphite. The following compn. gives good results: 11.5–13% of Si, 4–8% each of Mn and Cr, 0.8–2% of C, and the rest Co. From 5 to 30 parts of the Co may, however, be replaced by Mn, 5–12 by Cr, or 5–8 by Ni. The Co used may contain 4–7% of Ni and Fe as impurities. Maximum bending strength is obtained with 12–15% of Si. C should generally be between 0.5% and 1.2%, Si between 7 and 20%, Mn between 3 and 45%, and Cr or its equiv. between 4 and 10%. The C in the form of charcoal may be added to the molten Co, followed by Si and Mn together. The addition of Si produces evolution of heat, and should be gradual; CSI may be used, or the Si may be first combined with a small proportion of Co. Alternatively, mixed oxides of Co, Mn, and Cr may be reduced. The final alloy consists of particles of a metallic alloy of high cond. but liable to corrosion, enclosed in a substance, probably  $\text{CoSi}_2$ , of low cond. but high resistance to corrosion. The anodes can be used in solns. containing nitrates and chlorides, and at temps. up to 60°. They have a low anodic potential.

**Electrolytic recovery of copper from ores.** W. E. GREENAWALT. U. S. 1,373,557, Apr. 5. Cu ores are treated with an acid soln. to ext. the Cu, the soln. obtained is electrolyzed and  $\text{SO}_2$  is supplied as a reducing agent to the electrolyte by the use of finely divided charcoal in which  $\text{SO}_2$  may be occluded. The electrolyte is agitated with the charcoal and  $\text{SO}_2$  in order to reduce the salts of variable valence to their lower valency, *e. g.*,  $\text{Fe}_2(\text{SO}_4)_3$  to  $\text{FeSO}_4$ .

**Electrolytic refining of the precious metals.** E. SLATINEANU. Brit. 157,785, Jan. 10, 1921. In the sepu. of Pt from other metals, there is obtained a soln. containing Au and Pd. These are pptd., leaving a pure Pt soln. from which the metal is electro-deposited. The pptn. of Au and Pd may be effected by means of H previously treated with ultraviolet light, for instance by passing the gas through a helical silica tube surrounding a silica mercury-vapor lamp. If a plate of Au or Pd is placed in the soln., a voltaic couple is stated to be formed with the H. In obtaining the soln. of Pt, Au, and Pd, there may be employed broken ingots of impure Pt, or sludge, resulting from electrolytic treatment of impure gold anodes in  $\text{HNO}_3$  soln., the Ag being deposited on the cathode and Pt, Ir, Pd, Au, and Pb pptd. The impure metal or sludge may be treated with dil. aqua regia at 70° in a closed vessel provided with a stirrer. Only the Pt, Pd, and Au dissolve. An alternative method of obtaining such a soln. consists in

treating an impure Au anode in acid auric chloride soln. or aqua regia, Ag, Ir, Rh, Ru, etc., remaining undissolved. A part of the Au may then be deposited electrolytically, say in the same cell, but the soln. must be removed from the cell when it contains 3% of Au, 6% of Pt, and 0.5% of Pd. A suitable app. is specified.

**Galvanic batteries.** B. F. S. BADEN-POWELL. Brit. 158,733, Nov. 20, 1919. A cell consists of Fe and C electrodes in an electrolyte consisting of plain  $H_2O$ . The Fe electrode may be in the form of a rod, plate or cylinder and may form the outer vessel of the cell. The C electrode may be surrounded by a depolarizer such as a mixt. of C and  $MnO_2$  in a porous pot or sack or in the form of agglomerate blocks. The materials may be made up as a dry cell. According to the provisional specification, the electrolyte may consist of a soln. of sal-ammoniac,  $K_2CO_3$ , NaCl, or other chemical substance.

**Primary electric battery.** E. W. JUNGNER. U. S. 1,370,119, Mar. 1. The battery comprises a receptacle of wood, glass, pottery or other suitable material on the bottom of which there is placed a plate of Zn provided with a conducting wire. An electrolyte of NaCl soln. may be used. Above the electrolyte is a plate of porous, elec. conducting C (e. g., graphite) supported by cork floats of such size that only a small portion of the C plate is submerged in the electrolyte. In the upper portion of the C plate there is a recess filled with Hg from which another conducting wire extends to a terminal. The upper surface of the C plate is strewn with a thin layer of  $CuO$ . At the negative Zn pole,  $ZnCl_2$  is formed and at the positive pole NaOH is generated, which gradually fills up the pores of the C plate. The  $ZnCl_2$  and NaOH are, however, by diffusion spread through the electrolyte, wherein they react upon each other. Finely divided Cu reduced by the current and being in permanent contact with the porous C plate and also with the air combines with O from the latter and regenerates  $CuO$ . The main chem. deterioration of the battery is that due to conversion of the Zn into  $Zn(OH)_2$ , necessitating renewal of the Zn. Similar batteries may be formed with electrodes of Sn, Pb, Al or other metals with an electrolyte of salts of Na, K or  $NH_4$ . With a metal electrode of Fe, salts of Na, K and  $NH_4$  may be used. The combination of Fe with an  $NH_4$  salt electrolyte together with an air-depolarizing electrode gives a powerful and durable battery with a permanent electrolyte; as does also Sn with an  $NH_4$  salt. Finely divided Cu, Ag or Hg may serve as depolarizing materials. When  $NH_4$  salts are used a Mn compd. is preferably used as depolarizer as it is not dissolved by the electrolyte.

**Primary electric batteries.** E. M. DREMS and L. W. WILLIS. U. S. 1,373,801-2, Apr. 5. Structural features.

**Multiple-cell electric battery.** R. C. HOUSTON. U. S. 1,372,950, Mar. 29. Structural features.

**Electric dry battery.** A. C. RECKER. U. S. 1,374,168, Apr. 5. Structural features.

**Reclaiming dry batteries.** C. ELLIS and A. A. WELLS. U. S. 1,374,003, Apr. 5. Spent dry batteries of the Leclanché type are heated to melt the pitch and soften the solder, the Zn sheet is stripped from the C and depolarizing material, the C is sepd. and the depolarizing material is revived, e. g., by washing and treating with oxidizing agents.

**Battery cell cover.** R. M. JONES. U. S. 1,372,435, Mar. 22. Structural features.

**Storage battery.** R. L. HEBERLING and W. E. HOLLAND. U. S. 1,373,241, Mar. 29. Structural features.

**Storage battery electrode.** H. C. HUBBELL. U. S. 1,373,733, Apr. 5. Ni oxide and finely divided Cd are heated together in order to form negative electrode material for alk. storage batteries.

**Storage battery electrode.** H. C. HUBBELL. U. S. 1,373,734, Apr. 5. Pptd.  $Co(OH)_2$  is converted into oxide by heating with substantial exclusion of air, cooled and mixed with Ni and  $Ni(OH)_2$  and the mixt. is formed into electrodes for alk. storage batteries.

**Storage battery plates.** W. H. CRIMDITCH. U. S. 1,374,076, Apr. 5. Pb oxide containing  $Pb_3O_4$  is mixed with a regulated amt. of soln. of  $(NH_4)_2SO_4$  at a temp. at which a plastic mixt. is formed suitable for pasting on battery grids and the plastic mixt. is applied to form battery plates.

**Storage battery separators of tripoli.** F. T. BAIRD. U. S. reissue 15,067, Mar. 22. Original pat. 1,279,074; C. A. 12, 2498.

**Electric device for indicating the specific gravity of the electrolyte in storage batteries.** C. C. COX and G. W. LENTZ. U. S. 1,373,951, Apr. 5.

## 5—PHOTOGRAPHY

LOUIS DERR

**Acceleration of development by dyes and neutral salts.** H. LÜPPO-CRAMER. *Kolloid-Z.* 28, 174-5(1921).—After exposure, AgBr plates are bathed in 0.1% AgI in order to form the "development nuclei," and dyeing by erythrosin or acid green follows. Development with acid developer is notably accelerated. In general, acid dyes should be used with acid developer, basic dyes with alkaline developer. The addition of neutral salts to the developer, as, for example, 10% solid  $KNO_3$  or  $Na_2SO_4$  accelerates development.

L. DERR

**A new silver removal process.** A. STEIGMANN. *Kolloid-Z.* 28, 175-6(1921).—Sodium hyposulfite is added to the spent fixing bath preferably heated to 50-60°, whereupon metallic Ag is pptd. and the hypo regenerated, so that after filtering out the Ag the bath is again serviceable.

L. DERR

**The safranine process:** H. LÜPPO-CRAMER. *Phot. Rundschau* 57, 29-36(1920). **Practical significance of the safranine method.** H. KÖHN. *Ibid.* 38-9. **A revolution in photography.** H. LÜPPO-CRAMER. *Umschau* 25, 140-1(1921). **Washing phenosafranine from plates.** E. KÖNIG. *Phot. Rundschau* 57, 40(1920).—For these 4 papers cf. C. A. 15, 808-9. The removal of the color from the plate is much facilitated by the following bath: water 100 cc., 10%  $KNO_3$  or  $NaNO_3$  1 cc.,  $H_2SO_4$  1 cc.

L. DERR

**Sublimate and copper chloride as reducer of the persulfate type.** A. STEIGMANN. *Phot. Rundschau* 57, 52-3(1920).—The plate is bleached in a bath of 2 g.  $HgCl_2$ , 4 g.  $CuCl_2$ , washed and fixed in a hypo bath. This removes the AgCl and converts the image into brown Hg, flattening the density curves in a manner similar to the action of the persulfate reducer.

L. DERR

**The chemistry of the moving picture industry.** RODOLFO NAMIAS. *Ann. chim. sci. ind.* (1a-2a) 35-6, 91-8(1920).—A review.

E. PIETZ

**LAUBENHEIMER, KURT:** *Lehrbuch der Mikrophotographie.* Wien: Urban and Schwarzenberg. 220 pp. M. 36. For review see *Deut. med. Wochschr.* 47, 453(1921).

**Penrose's Annual.** *The Process Year Book.* New York: Tennant and Ward. 84 pp. \$5 net. This issue of the 23rd year of this compilation and record of progress in the higher departments of printing contains, among other things, information as to a new method of *color photography*, an improved method of *measuring color*, and a new method of sensitizing with dichromate. For review see *J. Frank. Inst.* 191, 430 (1921).

**Photography.** F. W. DONISTHORPE and DYE IMPRESSION PHOTOS, LTD. Brit. 158,021, Sept. 30, 1919. In the process of printing positives from dyed Ag negatives as described in 13,874, 1907 (C. A. 2, 1932), to obtain a satisfactory absorption of the dye into the undeveloped parts of the silver negative, the negative is treated in a bath containing a sufficient quantity of an acid such as oxalic acid. A bath containing V

oxalate with an excess of oxalic acid and a ferricyanide may be used. The base on which the dye transfer prints are made may be coated with hardened gelatin, and dyes, such as Patent blue, are used which have an affinity not only for soft gelatin but also for hardened gelatin. Commercial papers such as baryta-coated papers or art papers may be used for the prints. The prints may be enhanced by coating the print when dry with clear transparent oil or varnish to render the surface of the print transparent. Such treatment also makes the prints waterproof.

Color photography. J. CAMILLER and A. HAY. Brit. 158,670, Nov. 7, 1919. For making color screens, colored grains are mixed with a liquid tacky material into a paste which can be spread upon the glass or other support. The tacky material may be colored, and to facilitate mixing and spreading glycerol is added. The colored grains may be threads or particles of glass, or dyed gum. To form, *e. g.*, a two-colored screen, particles of one color are mixed with warm gelatin dyed a second color, into a paste. The outer surface of the screen is smoothed and the screen may be varnished.

Color-sensitive photographic emulsions. F. F. RENWICK and O. BLOCH. U. S. 1,372,548, Mar. 22. A dye of the auramine or iminodiphenylmethane class is used with a dye of the isocyanine class in rendering photographic emulsions sensitive to colors and of good keeping qualities.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Binary systems of lithium orthosilicate with zirconium orthosilicate and with calcium orthosilicate. ROBERT SCHWARZE and A. HAACKE. Freiburg i. B. *Z. anorg. allgem. Chem.* 115, 87-99(1921).—The systems were studied by means of cooling curves using a Pt-PtRh thermocouple. Mixtures were made up by 2 fusions with intervening pulverizing; no mention is made of checking the final product by analysis. In the system  $\text{Li}_4\text{SiO}_4\text{--ZrSiO}_4$  the thermal data for the 12 mixts. studied are summarized in tabular form, and the results interpreted in an equil. curve.  $\text{Li}_4\text{SiO}_4$  was found to melt at  $1249^\circ$ ; a binary compound,  $3\text{ZrSiO}_4\cdot 2\text{Li}_4\text{SiO}_4$ , congruently at  $1152^\circ$ ; and the intermediate eutectic, compn. 30 mol. %  $\text{ZrSiO}_4$ , at  $1021^\circ$ . The above compd. was still primary phase in the mixt. containing 70%  $\text{ZrSiO}_4$ , the richest in  $\text{ZrSiO}_4$  examd.; its temp. of primary crystn. was  $1062^\circ$ , and no eutectic break could be observed. Density curves and examn. of thin sections confirmed the above. Calcn. of the mol. wt. of  $\text{ZrSiO}_4$  from Raoult's law gave a value in accord with the above formula; the latent heat of fusion of  $\text{Li}_4\text{SiO}_4$  forming the basis for the computation was that calcd. by S. (C. A. 8, 2836). Thermal data are not given in the system  $\text{Li}_4\text{SiO}_4\text{--Ca}_2\text{SiO}_4$ , but only the equil. diagram. As drawn it shows mixed crystal formation up to 20 mol %  $\text{Ca}_2\text{SiO}_4$ , a eutectic at 30%  $\text{Ca}_2\text{SiO}_4$ , and beyond this mixed crystal formation with 2 max., at 40 and 60 mol. %  $\text{Ca}_2\text{SiO}_4$ , with a minimum at 50 mol. %  $\text{Ca}_2\text{SiO}_4$ . The system was not followed beyond 65%  $\text{Ca}_2\text{SiO}_4$ . Mixts. from 30 to 65 %  $\text{Ca}_2\text{SiO}_4$  showed a heat effect at approx.  $930^\circ$ , interpreted as indicating a compound  $\text{Li}_4\text{SiO}_4\cdot\text{Ca}_2\text{SiO}_4$ .

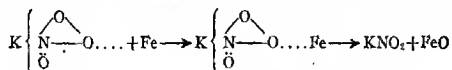
GEORGE W. MORREY

Alkali pentachloro- and pentabromoruthenates. A. GUTHRIE, F. FALCO and TH. VOGR. Stuttgart. *Z. anorg. allgem. Chem.* 115, 225-36(1921).—The pentachlororuthenates were prepd. from alkali chloride and  $\text{H}_2[\text{RuCl}_6]$  by evapn. to crystn., with purification by recrystn. from dil. HCl. They are slightly sol. in  $\text{H}_2\text{O}$ , and the  $\text{H}_2\text{O}$  soln. slowly decomposes giving a voluminous white ppt. The following were prepd.: *potassium pentachlororuthenate*,  $\text{K}_2[\text{RuCl}_6]\cdot\text{H}_2\text{O}$ , small reddish brown octahedra; *rubidium*,  $\text{Rb}_2[\text{RuCl}_6]\cdot\text{H}_2\text{O}$ , small reddish brown crystals; *cesium*,  $\text{Cs}_2[\text{RuCl}_6]\cdot\text{H}_2\text{O}$ , glistening brownish violet needles, and also as the anhydrous compd. with similar properties. The

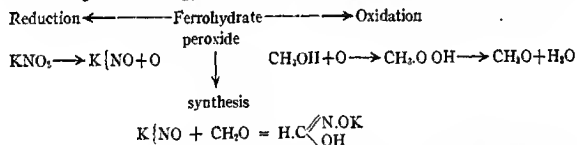
pentahomoruthenates were prepd. in a similar manner, but required recrystn. and evapn. over  $\text{H}_2\text{SO}_4$ . *Potassium pentabromoruthenate*,  $\text{K}_5[\text{RuBr}_5]$ , small deep colored dark reddish brown crystals; *rubidium*,  $\text{Rb}_5[\text{RuBr}_5] \cdot \text{H}_2\text{O}$ , small opaque needles; and *cesium*,  $\text{Cs}_5[\text{RuBr}_5]$ , glistening opaque octahedra, were prepd.

GEORGE W. MORREY

**Special chemical and physical properties of ferrous hydroxide peroxide: the reduction of alkali nitrate.** OSKAR BAUDISCH. Polytech. Zürich. *Ber.* 54B, 406-13 (1921).—Alkali nitrate can be completely reduced to nitrite in cold aq. soln. by metallic Fe in the absence of O. Since under these conditions the Fe is not attacked by the  $\text{H}_2\text{O}$  the reduction is not due to nascent H, but probably takes place as follows:



It is pointed out that both metallic Fe and ferrous hydroxide peroxide are magnetic, and that the latter like the former is probably capable of drawing to itself the subsidiary valence of the nitrate O atom and consequently of abstracting an atom of O from the nitrate mol. In view of this and the similarity in the phys. and chem. properties of metallic Fe and ferrous hydroxide peroxide, it is probable that the process of reduction of nitrate to nitrite by ferrous hydroxide peroxide is parallel to that of metallic Fe. On the other hand,  $\text{Fe}(\text{OH})_2$ , which is not magnetic, does not exhibit this strong affinity for nitrate O, and, therefore, is incapable of reducing nitrates to nitrites except in the presence of O. Ferrous hydroxide peroxide oxidizes alcohols to aldehydes. The synthesis of formaldoxime from MeOH and  $\text{NaNO}_2$  in the presence of  $\text{Fe}(\text{HCO}_2)_3$  has been carried out. In addition to formaldoxime, a small quantity of  $\text{CH}_3\text{NO}_2$  is formed. The following scheme is suggested for the mechanism of the process:



H. JERMAIN CREIGHTON

**The influence of radiant energy on the so-called exchange- or displacement reactions: reduction of alkali nitrite.** OSKAR BAUDISCH. *Ber.* 54B, 413-7(1921); cf. preceding abstract.—The reduction and sepn. of nitrate from nitrite by means of complex Fe salts is probably due to the unsatd. tervalent N atom of the nitrite attaching itself to the central Fe nucleus by means of its subsidiary valences, and its subsequent decompn. with the formation of NO. On the other hand, satd. nitrate N does not possess this capacity of forming coordinative compds. Complex salt reactions of this type have been termed "displacement reactions" by B. The course of the reduction of alkali nitrite by  $\text{K}_4\text{Fe}(\text{CN})_6$  and O is as follows: When warm, a CN residue is displaced from the inner sphere by O and an alkali mol. takes its place, the nitrite then decomposes, and the decompn. product NO is again displaced by O. These displacement reactions are influenced by light. Thus, under its action  $\left[ \begin{array}{cc} \text{II} & \text{CO} \\ | & | \\ \text{Fe}(\text{CN})_6 & \end{array} \right] \text{Me}_4$  evolves CO. It is shown that the decompn. of alkali nitrites by complex Fe salts can be effected by daylight energy at ordinary temps. A number of other displacement reactions are discussed.

H. JERMAIN CREIGHTON

**Bismuthochromocyanides, new complexes.** A. CH. VOURNAZOS. *Compt. rend.* 172, 535-7(1921).—On prolonged trituration of 4.4775 g. of  $\text{BiBr}_3$  with 1.9535 g. of KCN (both carefully dried *in vacuo* over  $\text{H}_2\text{SO}_4$ ), with the addition of small amts. of carefully

dried  $C_6H_{10}$  to form a smooth ointment-like mass, reaction takes place, which is completed by heating the mass in a stoppered flask on a water bath for 15-20 hrs. with 100 cc. of  $C_6H_{10}$ . The initial color is S-yellow, which turns to grayish white. On filtering and drying *in vacuo*, *potassium bismuthobromocyanide*,  $K_3[BiBr_3(CN)_2]$ , is obtained, decompd. by cold  $H_2O$ , sol. in dil. HCl, the soln. decompg. rapidly. Heated out of contact with air, KBr and Bi are formed. Similarly, 3.582 g. of  $BiBr_3$  and 3.213 g. of AgCN give silver bismuthobromocyanide,  $Ag_3[BiBr_3(CN)_2]$ , orange-yellow, insol. in  $H_2O$  and EtOH, decompd. by  $NH_4OH$  and KCN, reduced by sunlight to blackish gray changed by heating to AgBr and Bi. *Cuprous salt*,  $Cu_3[BiBr_3(CN)_2]$ , greenish gray powder, insol. in  $C_6H_{10}$  and cold  $H_2O$ , or  $C_6H_5O_4$ ; decompd. by hot  $H_2O$  into  $Cu_2Br_2$ ,  $BiO_2OH$  and HCN; decompd. by KCN, giving  $Bi(OH)_3$  and  $K_4Cu_2(CN)_8$ ; sol. in warm dil. HCl; heated out of contact with air it forms  $BiBr_3$ , C and Cu. *Hg salt*,  $2BiBr_3 \cdot 3Hg(CN)_2$ , S-yellow at first, changing to white cryst. powder consisting of long prismatic needles under the microscope.

M. R. SCHMIDT

Action of iodine on various metals in the cold. Detection of chlorine in the atmosphere. C. MATIGNON. *Compt. rend.* 172, 532-4(1921).—A particle of I placed on a small piece of Ag leaf produces a yellow circle, which increases in diam. until the leaf is converted into friable yellow AgI. Brass and Cu leaf react similarly, and at about the same rate as Ag; Al leaf is punctured at the points of contact, Sn slowly becomes yellow, Zn, Cd, Mg and Ca show liquid droplets of deliquesced salt around the I. If a piece of Ag leaf about 1 cm. long and 3  $\mu$  thick is covered in a transverse stripe 3 mm. wide by a moist layer of KI, and the leaf placed in an elec. circuit, the presence of 0.1 cc. of Cl in the air coming in contact with the KI will suffice to liberate enough I to complete the formation of AgI and break the circuit. It is proposed to utilize this action in devices for warning of the presence of Cl or Br in the air.

M. R. SCHMIDT

Cuprous oxides by reduction. V. V. SARMA. *Chem. News* 122, 99-100(1921).—By adding glucose to a cupric salt soln., and then making alk. with NaOH or KOH, a rich yellow ppt. is formed, which is very stable, and may be heated to  $150^\circ$  after drying without change of color. Dried at  $110^\circ$ , the yellow ppt. contained 82.02% of Cu, detd. by oxidation to  $CuO$ , and 82.69% Cu detd. by reduction to Cu in  $H_2$ . On shaking the yellow ppt. with  $Et_2O$ , a portion dissolves, giving a bluish green soln., while the insol. portion becomes dull yellow. Heating in a test tube forms a thin green coating, while red  $Cu_2O$  remains. On boiling with  $H_2O$ , a small portion remains in suspension, while the remainder settles as a granular powder of dull color. The suspended part is easily sol. in dil.  $H_2SO_4$  to form a colorless soln., remaining colorless on addition of  $NH_4OH$ , but then becoming blue on standing. It is believed that an appreciable amt. of  $CuOH$  is present in the yellow ppt. If cane sugar is used in place of glucose, only red  $Cu_2O$  is formed.

M. R. SCHMIDT

Preparation of chlorine heptoxide. FRIEDRICH MEYER AND H. G. KESSLER. *Ber.* 54B, 566-71(1921).—Liquid  $Cl_2O_7$  has been prepd. with very little danger as follows: A mixt. of 3 parts of  $KClO_4$  with 5 parts of  $SO_2Cl(OH)$  was distd. in a water-jet vacuum, with  $Et_2O \cdot CO_2$  as a cooling mixt. With a gradual rise in temp. to  $70-75^\circ$  there was obtained a boney-yellow liquid, which consisted of a mixt. of  $ClO_3$ ,  $Cl_2O_7$  and  $(SO_2)_2OCl_2$ . On distg. this mixt. in a vacuum a 50% yield of 98-99%  $Cl_2O_7$  was obtained. While  $Cl_2O_7$  has been prepd. by cautiously adding  $P_2O_5$  to cooled 70%  $HClO_4$  and distg. the mixt., the yield is small and small nerve-racking explosions occur during the process. Small quantities of  $Cl_2O_7$ , free from S compds., have been prepd. by absorbing 70%  $HClO_4$  in 3-4 times its wt. of purified, cooled kieselguhr, and  $P_2O_5$  in an equal wt. of kieselguhr, mixing the cooled powders and distg. off the  $Cl_2O_7$  at  $80-90^\circ$  under a pressure of 0.2 mm. The lower oxides of Cl can be removed by fractional distn. Where only a relatively pure  $Cl_2O_7$  is required, this method is rapid and free from danger. Pure solns. of  $Cl_2O_7$  in  $CCl_4$  have been prepd. by allowing 82 g. of 70% aq.  $HClO_4$  to flow

drop by drop into a rapidly stirred mixt. of 120 cc.  $\text{CCl}_4$  and 50 g.  $\text{P}_2\text{O}_5$  that has been cooled to  $0^\circ$ , warming the mixt., and filtering. In this way a 2.5% soln. of  $\text{Cl}_2\text{O}_7$  was obtained. By this method not even a trace of  $\text{COCl}_2$  was formed. Solns. having a higher  $\text{Cl}_2\text{O}_7$  concn. can be obtained by distg. the mixt. in a partial vacuum. The possible use of  $\text{CCl}_4$  solns. of  $\text{Cl}_2\text{O}_7$  in org. chemistry is mentioned. H. J. C.

The action of carbon on silicon. G. TAMMANN. Göttingen. *Z. anorg. allgem. Chem.* 115, 141-4(1921).—On heating amorphous Si with C (obtained from  $\text{CCl}_4$ , terpentine or sugar) an exothermic reaction takes place at  $1220$ – $1410^\circ$ , depending on the nature of the C. The product is a mixt., capable of sepn. into 2 fractions, heavier and lighter than 2.60. Analysis showed the fractions to be intermediate in compn. between  $\text{SiC}$  and  $\text{SiC}_2$ , and to increase in d. with increasing Si content. Further study is necessary to decide whether two substances are present or if mixed crystals are formed.

GEORGE W. MOREY

Action of sodium sulfide on ferric oxide (WITT) 2.

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Qualitative chemical analysis. V. MACRI. *Boll. chim. farm.* 59, 385-9(1920).—M. gives a scheme according to which the metals are detected approx. in the opposite order to that of the method commonly employed, one advantage of this procedure being that it allows of the use of fixed alkalies or their salts. J. C. S.

A reaction of the salts of manganese. V. MACRI. *Ann. chim. anal. chim. appl.* 3, 55-6(1921).—In pptg.  $\text{CaC}_2\text{O}_4$  from an  $\text{HOAc}$  soln., a rose coloration is often noticed. This color was proved to be due to traces of Mn. If a very dil. soln. of Mn is made alk. and a few drops of  $\text{Na}_2\text{C}_2\text{O}_4$  and  $\text{HOAc}$  are added, the soln. becomes rose-red. The reaction is still more sensitive if the alk. Mn soln. is boiled before adding the oxalate and acid, but no color appears if a strong inorg. acid is used. The presence of an oxalate appears to be indispensable. The salts of other metals do not prevent the color. This coloration appears in a 1:1000 Mn soln. even when it is not first boiled.  $\text{H}_3\text{PO}_4$  gives a similar coloration to that of  $\text{H}_2\text{C}_2\text{O}_4$ . C. C. DAVIS

The influence of atmospheric carbon dioxide on alkalimetric titrations, using phenolphthalein as an indicator. G. BRÜHNS. *Z. Zuckerind. czechoslov. Rep.* 44, 331-5 (1920).—Previous investigators of this subject (Scholtz, *Arch. Pharm.* 1904, 575) (Lehmann and Wolff, *C. A.* 11, 3005) did not consider the effect of atm.  $\text{CO}_2$ . Comparative titrations, using 0.01 N  $\text{NaOH}$  and  $\text{HCl}$  solns., with phenolphthalein and Me orange as indicators, gave an av. discrepancy of 0.5 cc. for each 10 cc. of soln. taken, the phenolphthalein indicating the lower results. The difference depended on the amt. of  $\text{CO}_2$  the solns. absorbed from the atm. This influence was also shown in titrating refinery juices made alkaline with  $\text{NaOH}$ ,  $\text{KOH}$ , lime, strontia, and baryta-water, using both phenolphthalein and lacmoid as indicators. The error introduced varied from 3.2 to 12%. Alkalimetric titrations require extreme rapidity in order to minimize the effect of the atm.  $\text{CO}_2$ . JOHN M. KRNO

The determination of aromatic hydrocarbons in mixtures of hydrocarbons. H. T. TIZARD AND A. G. MARSHALL. *J. Soc. Chem. Ind.* 40, 20-3T(1921).—The method proposed is a development of the method of Thale (*J. Soc. Chem. Ind.*, 38, 39T(1919)). The petrol (naphtha) is fractionated in the way suggested by Thale, but instead of detg. the densities of the fractions before and after treatment with 98%  $\text{H}_2\text{SO}_4$ , the data for calcg. the %s of aromatic hydrocarbons are obtained by applying a modification of Chavanne and Simon's critical soln. temp. method, using  $\text{PhNH}_2$  (*C. A.* 13,



2125; 14, 117). The detn. of the critical soln. temp. requires several expts. with each sample, and is, therefore, slow and impractical for regular lab. use. The soln. temp. of equal vols. of sample and  $\text{PhNH}_2$ , *i. e.*, the temp. at which two liquid layers are formed upon cooling the soln. from higher temps., is used by T. and M. to replace the critical soln. temp. This temp. is called by them the "aniline point". The accuracy of the detn. is satisfactory ( $0.1^\circ$ ), and the use of this const. instead of the critical soln. temp. has been found to be reliable. For mixts. with low %'s of aromatic hydrocarbons, the two values agree to within  $0.1^\circ$ , but for higher %'s of aromatics, the two may differ considerably. The effects of errors in vol. measurements are negligible in the first case, and not serious in the second. For a content of 39% of aromatics, an error of 2% in the vol. measurement causes an error of only  $0.3^\circ$  in the content of aromatics. Ten cc. of the sample and 10 cc. of the aniline (freshly distd., free from aminothiophene) are measured into a large test tube, fitted with a stirrer and thermometer. The mixt. is heated until it becomes homogeneous, and is then allowed to cool until it becomes turbid. The temp. is then raised only slightly and a duplicate detn. made. A slight initial turbidity is disregarded, the temp. being taken when the soln. becomes completely cloudy (range of  $0.1^\circ$ ). The means of heating is a naked flame. If the aniline point is more than  $10^\circ$  above room temp., another larger tube is used to form an air jacket. Cooling baths or ether placed in the jacket tube and evapd. by a current of air may be used for temps. below room temp. One advantage of the method is the fact that benzene, toluene and the xylene cause about equal lowerings of the aniline point of a naphtha when added in equal %'s by wt. (Curves are given for this feature of the work.) If extreme accuracy is not desired, washing and drying of the mixt. after treatment with 98%  $\text{H}_2\text{SO}_4$  soln. is not necessary ( $0.2^\circ$  difference in aniline point, on the av.). The effect of the character of the non-aromatic portion of the naphtha has been found to have very little effect upon the lowering of the aniline point by aromatics (the abs. values are, of course, quite different). The following table is, therefore, satisfactory for use with all natural naphthas.

% of aromatic hydrocarbon in mixture.	Lowering of aniline point.
5	4.2° C.
10	8.6
15	13.2
20	18.1
25	23.2
30	28.5
35	34.0
	39.8

W. F. FARAGHER

Estimation of acetaldehyde in paracetaldehyde. W. STURWE. *Apoth. Ztg.* 35, 153-4 (1920); *J. Chem. Soc.* 118, II, 564.—Paracetaldehyde (5 cc.) is brought into a 100 cc. flask and frequently shaken during a quarter of an hour with 0.1 N  $\text{HgCl}_2$  soln. (10 cc.), KI free from iodate (2 g.), NaOH soln. (15%, 20 g.), and  $\text{H}_2\text{O}$  (50 g.). The mixt. is dild. to 100 cc. and filtered. 50 cc. of the filtrate are treated with gum arabic (0.5 g.), NaOH soln. (5 cc.), and  $\text{CH}_2\text{O}$  (3cc.); after 2 min. the soln. is acidified with dil. AcOH (16 cc.), and subsequently cooled. The pptd. Hg is dissolved by the addition of a measured vol. of 0.1 N I soln., and the excess of the latter titrated. W. O. E.

Determination of water in alcohols. TH. WIRTH. *Z. Deut. Oel-Fett Ind.* 41, 147 (1921).—Method: 5 g. Ca hydride of pea-size are overlaid in a 50 cc. flask by xylene which has been dehydrated by boiling with Ca hydride. The flask carries a stopper, fitted with a dropping funnel, an inlet- and an exit-tube, the latter connected to a gas

buret. The xylene is brought to boiling for a moment to dislodge air adhering to the Ca hydride and the air is displaced by dry, pure  $\text{CO}_2$  until completely cooled. About 1 g. of the alc. to be examd. is sucked into the flask through the dropping funnel by lowering the leveling tube of the gas buret and the funnel is rinsed with 10 cc. xylene. Evolution of  $\text{H}_2$  begins immediately, half of which is derived from  $\text{H}_2\text{O}$  and the other half from Ca hydride according to the equation:  $\text{CaH}_2 + \text{H}_2\text{O} + \text{CO}_2 = \text{CaCO}_3 + 2\text{H}_2$ . The reaction is allowed to go for 45 min., passing  $\text{CO}_2$  through at the rate of 2 bubbles per second, the  $\text{CO}_2$  being absorbed by KOH in the gas buret. When the gas vol. remains const., it is read and reduced to  $0^\circ$  and 760 mm. For calcn. 1  $\text{H}_2$  corresponds to  $\frac{1}{2}$   $\text{H}_2\text{O}$ .

P. ESCHER

**Determination of volatile alcohols.** AN. GRÜN AND TH. WIRTH. *Z. Deut. Oel-Fett Ind.* 41, 145-7 (1921).—Weigh 0.5 to 1.0 g. sample into a 100-cc. flask and add 5 to 10 cc. chlorolauric acid (made by distg. a mixt. of lauric acid with  $\text{PCl}_5$  or  $\text{PCl}_3$ ). Stopper the flask with a cotton plug and keep at about  $60^\circ$  for  $\frac{1}{4}$  to 3 hrs. Shake with 50 cc.  $\text{H}_2\text{O}$  and boil for 1 min. (use a cork with safety tube), thereby decomposing the excess of chlorolauric acid into free HCl and lauric acid. Transfer the contents after cooling to a 250-cc. separatory funnel, rinsing the flask with 10-cc. portions of ether; draw off the lower layer of HCl soln., wash the ether soln. with  $\text{H}_2\text{O}$  and transfer to an Erlenmeyer flask, washing the funnel with 10-cc. portions of alc. Neutralize the soln. with its free lauric acid and saponify. From the no. of cc. alkali required calc. the hydroxyl no., i. e., the no. of mg. KOH required for sapon. by 1 g. substance. Examples of 6 analyses of different alcs. are given which show that simple, readily volatile alcs. can be accurately detd., but such alcs. as geraniol or methylnonylcarbinol require 3 hrs. at  $80^\circ$ . Secondary alcs. whose OH group is attached to a ring C-atom, like menthol, and tertiary alcs. do not yield correct quant. results.

P. ESCHER

**Differential analysis of acetone, acetaldehyde, and formaldehyde in organic liquids.** EMILIO PITTARELLI. *Arch. farm. sper.* 29, 70-87 (1920).—The various methods depending on pptn., coloration, or odor for the detection of acetone,  $\text{AcH}$ , and  $\text{CH}_2\text{O}$  are described and discussed as regards their application to fermented liquids, milk, urine, etc. In the examn. of urine, the free acetone may be sepd. by treatment with excess of Nessler's reagent, and the combined acetone by distg. the filtrate with an acid.

J. C. S.

**A reaction differentiating between theobromine and caffeine.** M. MALMY. *J. pharm. chim.* 23, 89-91 (1921).—Soln. of K-I-bismuthate added to a 5% theobromine-HCl soln. forms a chocolate brown with a similar caffeine soln. a bright red ppt. (Codex 1908). The Supplement of 1920 states both ppts. to be bright red. M. finds both to be of a permanent orange color, if freshly prepared Bi solns. are used. With very old solns. (6 yrs. +) the orange theobromine ppt. in 5-6 hrs. is changed to chocolate brown, that of caffeine to bright (minium) red, due to old reagent containing a certain amt. of HI which reduces the Bi ppt. To obtain the reaction readily, put into sep. test tubes theobromine and caffeine (0.05 g. of each), mix each with  $\text{H}_2\text{O}$  10 cc. and add fresh soln. of K-I bismuthate 0.5 cc. (this being sufficiently acid). To each of the orange colored ppts. add 5 drops of very old 10% tincture of I containing about 1% HI. The caffeine ppt. turns a permanent minium red, that of theobromine chocolate brown, in 30 min. The presence of EtOH does not affect the reactions. The direction of the Codex to keep the bismuthate protected from light should be reversed so as to prevent formation of HI.

S. WALDBOTT

**Estimation of terpin.** OBANILLO FERNÁNDEZ AND N. LUENGO. *Anal. fis. quim.* 18, 158-65 (1920).—When terpin is treated with  $\text{Ac}_2\text{O}$  and anhydrous  $\text{AcONa}$ , only one of its two hydroxyl groups is acetylated; hence it behaves like a monohydric alc., although the results are slightly high. When a small quantity of  $\text{H}_2\text{SO}_4$  is used instead of  $\text{AcONa}$ , the reaction takes place spontaneously, and one hydroxyl group is acety-

lated. The quantity of  $\text{Ac}_2\text{O}$  required is 2-3 times that of the terpin, the mixt. being left for 1 or 2 hrs. Complete esterification is achieved by Boulez's method (C. A. 1, 1412): 5 g. of terpin are dissolved in 25 g. of rectified oil of turpentine and 40 g. of  $\text{Ac}_2\text{O}$ . Three g. of fused  $\text{AcONa}$  are added, and the mixt. is boiled for 3 hrs. The liquid is digested for 20 min. on the water bath with a little water, and a satd. salt soln. added; the top layer is made up to 100 cc. with oil of turpentine and dehydrated with calcined Na sulfate; an aliquot part of the liquid is then hydrolyzed with alc. 0.5 N NaOH soln.

J. C. S.

Use of ultrafiltration in toxicological analysis. C. MANNICH AND G. WIPPERLING. *Ber. pharm. Ges.* 30, 348-61(1920); *J. Chem. Soc.* 118, II, 767.—Ultrafiltration (filtration through collodion membrane) is not suitable generally for toxicological work, owing to loss of alkaloids and heavy metals through absorption of same by the membrane. While the loss is small, it is important enough when dealing with poisons in traces; it is greatest for Hg but practically negligible for As and Sb. The method is, however, useful for the sepn. of  $\text{KClO}_3$  and  $\text{C}_6\text{O}_4\text{H}_2$  from organic substances. W. O. E.

Evaporation of aqua ammonia (AUERRACH, MILLBRADT) 18. Action of iodine on various metals in the cold. Detection of chlorine in the atmosphere (MATIGNON) 6. Platinum substitutes (ARNDT) 1.

BRÄUNER, BOHUSLAV AND KŘEPELKA, JINDŘICH: Analýza kvalitativní pro poslucháče (zastácníky) české university. Prague: Publikace československé lékařnické společnosti. For review see *Chem. Listy* 15, 97(1921).

Technical Methods of Analysis as Employed in the Laboratories of Arthur D. Little, Inc., Cambridge, Mass. Edited by Roger C. Griffin. New York: McGraw-Hill Book Co. For review see *Pulp Paper Mag. Can.* 19, 435(1921).

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

ROGAR T. WHERRY AND WALTER F. HUNT

Pulverulent mineral [fluorite] from Dorgali, Sardinia. ENRICO CLERICI. *Atti accad. Lincei* 29, I, 309-12(1920).—This mineral, which is shown by its physical and chem. properties to be fluorite, exhibits thermoluminescence, even under  $\text{CCl}_4$  or acetone, and emits radiations capable of influencing photographic plates and of penetrating glass, mica, or gelatin, but not Al or black paper. This phenomenon may be due to the presence of traces of rare earths.

J. C. S.

The Divide silver district, Nevada. ADOLF KNOPP. U. S. Geol. Survey. *Bull.* 715K, 147-70(1921).—This district centers at Gold Mt., 5 miles south of Tonopah. The Ag deposit was found by chance when driving a cross cut to intercept a Au vein. The latest est. is 52000 tons of ore, containing 1 million oz. of Ag, for this district.

L. W. RIGGS

Platinum and the platiniferous deposits in the Ural and in the world. W. KILIAN. *Rev. sci.* 59, 101-7(1921).—An extensive review of the book by Duparc and Tikonowitch (Geneva, 1920).

L. W. RIGGS

Geography, geology, and mineral resources of the Fort Hall Indian Reservation, Idaho. G. R. MANSFIELD. U. S. Geol. Survey, *Bull.* 713, 119 pp.(1920).—This reservation includes about 800 sq. mi. in south-eastern Idaho in which there is estd. to be over 738 million long tons of phosphate rock averaging 70%  $\text{Ca}_3(\text{PO}_4)_2$ . The western field as a whole is estd. to contain over 5 billion long tons of high-grade rock. Coal and metalliferous prospects have yielded no production, but placer mining has brought small returns. Ore containing 22% Cu has been shipped. Volcanic ash similar

to the Nebraska ash is in abundance. Water resources. W. B. HEROV. *Ibid* 119-48.—The water supply of the Fort Hall Reservation is described with reference to irrigation and power. L. W. RIGGS

**Character of coal in the Thomas bed near Harrison, W. Va.** M. R. CAMPBELL. U. S. Geol. Survey, *Bull.* 716-H, 239-41 (1921).—Coal from the Oakmont mine was reported by the U. S. Geol. Survey to contain 2.95% S. Upon protest by the owners the coal was again sampled and analyzed with the result that 3 samples gave 1.01, 1.56 and 2.78% resp. of S, the latter figure being for a sample taken about the same distance from the mouth of the mine as the sample containing 2.95% S. L. W. RIGGS

**Coal in the middle and eastern parts of San Juan County, New Mexico.** C. M. BAUER AND J. B. REESIDE, JR. U. S. Geol. Survey, *Bull.* 716-G, 155-237 (1921).—The geographic, climatic and geologic features of the region are fully described. Logs of extensive borings are given. The estd. amt. of coal to a depth of not more than 1000 ft. in an area of 747 sq. mi. is over 16 billion tons, with a usable amt. of 10 billion tons. The coal is bituminous in certain areas and sub-bituminous in others. Sampling and analyses were performed according to the methods of the Bureau of Mines, and the results from 14 samples show an av. B.t.u. of about 11000 for coal as it came from the bed. This is about 1000 B.t.u. lower than 9 possibly competing coals from Colorado, and 5 from other localities in New Mexico. L. W. RIGGS

**Geology of the igneous rocks of Essex County, Mass.** CHARLES H. CLAPP. U. S. Geol. Survey, *Bull.* 704, 127 pp. (1921).—"The objects of this report were (1) To publish the author's conclusions upon the subject in order to make future more detailed work easier and of greater value. (2) To assemble much of the scattered and unpublished work of the geologic staffs and students of the Mass. Inst. of Technology and of Harvard Univ. (3) To throw light on some of the broader principles of the geology of igneous rocks, notably the formation of hybrid rocks by contact brecciation and assimilation and by impregnation of invaded rocks, and the differentiation of subalk. magmas." Upwards of 70 chem. analyses are given most of which are quoted from Washington's tables, (cf. C. A. 12, 798.) L. W. RIGGS

**Volcanic necks in Lake Janisjarvi in Eastern Finland.** PENNY ESKOLA. *Bull. Comm. Geol. Finlande* 55, 13 pp. (1921).—The remains of 2 volcanic necks forming islands in Lake Janisjarvi, eastern Finland, are described. Two analyses are given: (I)  $\text{SiO}_2$  59.63,  $\text{Al}_2\text{O}_3$  18.11,  $\text{Fe}_2\text{O}_3$  1.12,  $\text{FeO}$  5.87,  $\text{MnO}$  0.14,  $\text{MgO}$  2.15,  $\text{CaO}$  3.06,  $\text{Na}_2\text{O}$  2.17,  $\text{K}_2\text{O}$  3.75,  $\text{TiO}_2$  0.97,  $\text{P}_2\text{O}_5$  0.17,  $\text{H}_2\text{O}$  3.68, sum 100.62%; sp. gr. 2.56. (II)  $\text{SiO}_2$  60.92,  $\text{Al}_2\text{O}_3$  19.08,  $\text{Fe}_2\text{O}_3$  1.64,  $\text{FeO}$  5.47,  $\text{MnO}$  0.13,  $\text{MgO}$  1.41,  $\text{CaO}$  1.92,  $\text{Na}_2\text{O}$  2.54,  $\text{K}_2\text{O}$  3.36,  $\text{TiO}_2$  0.70,  $\text{P}_2\text{O}_5$  0.20,  $\text{H}_2\text{O}$  2.84, sum 100.21%; sp. gr. 2.63. Rock I is cryptocryst. and partly glassy with embedded minute crystals of hornblende and ilmenite. Rock II shows some small crystals of plagioclase, with rounded grains of hypersthene and biotite in the groundmass. The lava rocks have the compn. of an argillaceous sediment, and it is thought that their peculiar compn. is due to assimilation on a large scale of the country rock, which is mica schist. S. G. GORDON

**The basic monzonite rocks near Smølingen Lake in Darlarne.** N. H. MAGNUSSON. *Geol. För. Förh.* 42, 413-34 (1920).—These basic monzonite rocks, mostly olivine-monzonite, were shown by chem. analysis to be similar to "kentallenite" from Argyllshire and pyroxene-syenite from Goroschki. Compn.:  $\text{SiO}_2$  50.35,  $\text{Al}_2\text{O}_3$  15.76,  $\text{Fe}_2\text{O}_3$  2.32,  $\text{FeO}$  7.30,  $\text{MgO}$  7.40,  $\text{CaO}$  10.12,  $\text{Na}_2\text{O}$  2.75,  $\text{K}_2\text{O}$  3.89,  $\text{H}_2\text{O}$  0.45,  $\text{CO}_2$  0.00,  $\text{TiO}_2$  0.30,  $\text{P}_2\text{O}_5$  0.39,  $\text{MnO}$  0.35, sum 101.38%; corresponding to Na-Ca feldspar 33, orthoclase 20, pyroxene 25, olivine 12, biotite 6, magnetite 3, and apatite 1%. W. SEGERBLOM

**The composition of dolomites.** IRENE EVERMAN, O'NEAL MASON, AND GLENN BROWNING. *Chem. News* 122, 109-10 (1921).—Thirteen analyses of dolomites from the following localities are given: Le Grand, Iowa; Gouverneur, N. Y.; Cape Breton Island; Frizington, England; Marquette, Mich.; Tuckahoe, N. Y.; New Almaden,

Calif.; Providence, R. I.; White Pine, Nev.; Guanajuato, Mex.; Nagyag, Transylvania; Clayton, Iowa; and Dubuque, Iowa. S. G. GORDON

Catalog of Swedish geological, paleontological, petrographic and mineralogical literature for 1918 and 1919. FR. B. ARLANDER. *Geol. Förr. Förh.* 42, 453-64 (1920); cf. *C. A.* 15, 43.—A list of titles, names of authors, and references for about 200 papers, arranged alphabetically by authors, covering investigations relating primarily to Sweden. Many are in English, and some are chem. in nature. W. SEGERBLOM

A graphic method for the comparison of minerals with four variable components forming two isomorphous pairs. EDWARD S. SIMPSON. *Mineralog. Mag.* 19, 99-106 (1920).—A graphic method employing two rectangular coordinates was found convenient in studying a mineral of the spinel group to bring out its relationship to the type minerals spinel, hercynite, and chromite and to the intermediate minerals picotite, chrompicotite, magnesiochromite and magnochromite. The method is applicable also to a large number of series of minerals whose components consist of two pairs of isomorphous variables, associated with one or more invariable: garnet, staurolite, chloritoid, alunite-natrojarosite, apatite-mimetite, arsenopyrite-alloclasite, gersdorffite-ullmannite. W. F. HUNT

Constancy of the ratio of actinium to uranium in natural minerals (MEYER, HESS) 3.

ARTINI, E.: *I Minerali*. 2nd Ed. revized and enlarged. Milan: Ulrico Hoepli. 518 pp. L. 25. For review see *Boll. chim. farm.* 60, 24 (1921).

LÉCUONA, S. M.: *Essai rapide des minerais*. Paris: Dunod. 56 pp. For review see *Anales soc. quim. Argentina* 9, 69 (1921).

### 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST AND R. S. WILLIAMS

Ore flotation. C. RATEL. *Age de fer* 36, 731-3, 762-4, 794-6 (1920); 37, 850-3 (1921).—General discussion of the phenomena of *surface tension* from the point of view of ore flotation; of the applications of the principles to the practice of flotation, and more particularly of the functions of oils and various emulsifying agents; and of the relation between the nature of the ore and its suitability for treatment by this process. The information is drawn exclusively from American and English sources. A. P.-C.

The production of copper, gold, lead, nickel, silver, zinc, and other metals in Canada during 1919. ARTHUR BUISSON. Can. Dept. Mines, *Mines Branch* 547, 76 pp. (1921). E. H.

Gold, silver, copper and lead in Alaska in 1919. ALFRED H. BROOKS AND GEORGE C. MARTIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 227-33 (Preprint No. 12, published April 25, 1921). E. H.

Gold, silver, copper, lead and zinc in California and Oregon in 1919. CHARLES G. YALE. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 181-226 (Preprint No. 11, published Apr. 20, 1921). E. H.

Manganese and manganiferous ores in 1919. H. A. C. JENISON. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 93-148 (Preprint No. 9, published Apr. 6, 1921). E. H.

Quicksilver in 1919. F. L. RANSOME AND ISABEL P. EVANS. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 149-80 (Preprint No. 10, published Apr. 5, 1921). E. H.

Zinc in 1918. C. E. SIEBENTHAL. U. S. Geol. Survey, *Mineral Resources of U. S., 1918*, Part I, 1027-74 (Preprint No. 31, published Apr. 29, 1921). E. H.

New blast furnace recently completed at Midland, Pa. ANON. *Iron Age* 107, 570-5 (1921).—Description of a new blast furnace of the Pittsburgh Crucible Steel Co. R. S. DEAN

**Air-cooled slag pockets.** ANON. *Iron Age* 107, 901 (1921).—The Whalen patented removable air-cooled slag pocket consists of a brickwork construction mounted on a movable iron plate with spaces provided in the brickwork for circulation of air. This pocket is placed within the regular slag pocket. By air-cooling the slag contracts in chunks and becomes flaky next to the brickwork, thereby freeing itself from the brickwork and permitting its easy removal.

O. A. HOUGHAN

**Smelting the titaniferous iron sands of New Zealand.** J. A. HASKETT. *New Zealand J. Sci. Tech.* 3, 111-4 (1920).—A résumé of expts. carried out by the New Zealand Iron-ore Smelt. & Mfg. Co. (Ltd.) at New Plymouth, 1914-19. The sand is probably a titaniferous magnetite contg. about 9%  $\text{TiO}_2$ . Direct reduction by making a "ferro-coke" from coal and sand, failed because the ferro-coke became friable at incandescence and clogged the blast-furnace hearth. Briquets of coal and sand gave a low yield. Then the briquets were carbonized and charged with coke and limestone; but trouble was caused by a very viscous layer of titaniferous material which appeared between the fluid slag and the fluid metal and finally prevented proper sepn. of iron and slag. A process has been patented for briquetting and sintering together pulverized limestone and coal with iron sand, and this process is about to be tried out. J. ALEXANDER

**Mechanical handling of steel-mill material.** C. F. POPPLETON. *Blast Furnace and Steel Plant* 9, 291-8 (1921). E. H.

**Gas furnaces for melting non-ferrous metals.** M. A. COMBS. *Chem. Met. Eng.* 24, 515-6 (1921).—Gas is superior to coal or oil as a fuel for the melting of non-ferrous metals because combustion can be more easily controlled and the cost of storage, metal loss and refractories is less. Costs for the crucible melting of 100 lb. of brass with gas at \$1.20 per thousand cubic feet, coal at \$16 per ton and oil at 16 cts. per gallon are for coal firing \$3.32, oil firing \$2.21, gas firing \$2.21. The cost of refractories for gas-fired furnaces is less than for elec. furnaces.

O. A. HOUGHAN

**Treatment of antimonial gold ore at the Globe and Phoenix gold mine, Southern Rhodesia.** V. E. ROBINSON. *J. Chem. Met. Soc. S. Africa* 21, 117-19 (1921).—An analysis of the ore shows 76.32%  $\text{SiO}_2$  and insol., 0.73 Sb, 2.58 Fe, 0.96 S, 1.21 CaO, 6.44 MgO with traces of As and Cu. The Sb varies considerably, is present in the form of stibnite and runs sometimes as high as 2.39% Sb. Much of the gold present in the ore is free and easily caught on amalgamated plates; some of it is coated, but is amalgamated in grinding pans, and some escapes the pans and is retained on canvas strakes. The presence of the stibnite, and also possibly ferrous iron, makes it impossible to treat the tailing directly by cyanide, but after it is allowed to oxidize partially by weathering it can be cyanided. In general the method of treatment is to pass the ore over amalgamating plates to grinding pans after it has been broken, sorted and wet-crushed by stamps. It next passes over canvas strakes to a classifier which seps. sand from slime. The sand is discharged to a dump,—the slime to dams. Both are allowed to oxidize by weathering, after which the sand is ground in tube mills in KCN soln. and treated by counter-current continuous decantation, while the slime is treated by the ordinary decantation method. The width of the strakes is of more importance than their length. If width must be curtailed through insufficient space it is well to install steptables with a drop every 6 ft. with a  $1\frac{1}{2}$ " drop per ft. Convenient width of strake is 30". Blankets should not be more than 36" long. Canvas is superior to blanket in saving fine gold. 0.03% KCN soln. is used in the tube mill circuit for handling sand. The slime dams occupy about 5 acres; this is divided into 3 sep. portions, each being 6 ft. deep so that while one is being filled, another is full and awaiting treatment and the 3rd is under treatment. When a dam is full it is allowed to dry sufficiently to hold oxen and plough and the whole surface is ploughed several times, thus exposing various surfaces to the weather. Under the best conditions the slime will oxidize sufficiently for treatment in about 20 days. The sand will ordinarily be on the dump 6 months

be'ore treatment. The addition of a certain amt. of CaO to oxidized material decreases KCN consumption. Too much is fatal to a good extn. H. C. PARISH

Influence of soluble silica and calcium salts on precipitation. J. HAYWARD JOHN-SON. *J. Chem. Met. Soc. S. Africa* 21, 121-3, 119-20(1921); cf. *C. A.* 15, 652.—The conditions of soln. for Au pptn. may be varied by (a) the compn. of the ore, (b) water supply, (c) CaO, (d) chem. compn. and phys. condition of Zn, and (e) temp. The City and Suburban plant had trouble with a cream-colored ppt. of a light and flocculent nature, which formed in the steady-bead vat and sand ext. boxes. This substance contained 53.47%  $MgCO_3$ , 15.36%  $CaCO_3$ , 11.93%  $Zn(OH)_2$ , 8.76%  $Fe_2O_3 + Al_2O_3$ , 4.03% HCl-insol., 3.57%  $Na_2SO_4$  and 2.85% chlorides, alkali and cyanide undetd. A dried sample of a similar ppt. contained 9.6 dwt. fine Au per ton. H. C. PARISH

The construction and operation of a cyanide plant in Ecuador. PAUL C. SCHRAPS. *Eng. Mining J.* 111, 579-86(1921).—A description of the operation and construction of a plant of the S. Am. Development Co. at the Zaruma mines. The veins carry Au and Ag at present in proportion of 1 to 3.75 by wt. The mines are operated for the Au. The ore from branch veins has a quartz and country-rock gang with little or no calcite but a high proportion of pyrite, chalcopyrite, sphalerite and galena. The ore from the main fissuring is more amenable to treatment although the presence of calcite makes settling after fine grinding more difficult. Both classes of ore carry tetrahedrite with which the Au and Ag are closely associated. H. C. PARISH

A new method of charging reverberatory furnaces. J. O. AMBLER. *Eng. Mining J.* 111, 228(1921).—By means of a mechanically driven worm screw the charging of reverberatory furnaces at a continuous rate and without production of dust has been successfully applied to a Cu reverberatory smelting furnace. The fluxing action of the dust is practically eliminated, this advantage alone more than paying for the cost of operating the screw. Better utilization of heat is effected because the furnace temp. does not fluctuate owing to intermittent charging. Air filtration is eliminated by charging through dust-proof pipes, effecting further economy of heat and refractories.

O. A. HOUGH

Efficient method of charging cupolas and small copper blast furnaces. A. W. CARROL. *Mining and Met.* 1920, No. 168, 44-5.—The material is properly distributed on a plate alongside of the charging door of the furnace and is pushed in at intervals by means of an air-operated plunger. R. S. D.

Judging sands for foundry use. HENRY B. HANLEY AND HERBERT R. SIMONDS. *Foundry* 48, 772-4, 867-8, 875, 921-2(1921).—Sand for foundry use has 3 characteristics: refractoriness, cohesion and porosity. Foundry sands may be divided into molding sand, core sand, facing sand, fire sand, gravel, high-silica sand and parting sand. Molding sand is usually a natural sand and a mixt. of quartz, feldspar and clay. Core sand is an artificial sand containing a binder as molasses. Chem. analyses of typical sands are given and their interpretation is discussed. Other tests for sand are also discussed. The best test for the amt. of bond in a sand is the adsorption of methyl violet. This is best detd. by adding the dye to a soln. of the colloids from the sand till a color is produced and then removing the dye by means of mordanted cotton yarn and comparing the color of the yarn with that of standards. The strength of the bond depends on the surface of the sand particles as well as on the amt. of bond. Methods of chem. and mechanical analysis are given in detail. R. S. DEAN

The reclamation of metals from foundry waste. J. P. NORRIE. *Can. Chem. Met.* 5, 77-9(1921).—A description of reclaiming processes for the recovery of metals from brass foundry wastes. N. outlines the processes, giving flow sheets, used by the Rome Brass & Copper Co., Rome, N. Y. and by the Monarch Metal Co., Hamilton, Ont.

F. W. COBB

Metallographic investigation of the system bismuth-selenium. NAOJIRO TOMO-

SHIGE. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 55-60(1919).—In the abstract in *C. A.* 15, 1007-8 the "BiSe" coming before the "(m. 688°)" on the 3rd line of page 1008 and likewise the "BiSe" of lines 4 and 6 of the same page should read  $\text{Bi}_2\text{Se}_3$ . E. J. C.

Introduction to symposium on corrosion of iron and steel. WM. H. WALKER. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—A short review. C. G. F.

Steel rails from sink-head and ordinary ingots. GEO. K. BURGESS. *Bur. of Standards, Tech. Paper* 178, 61 pp.(1920); *Chem. Met. Eng.* 23, 921-5, 969-75, 1017-22 (1920).—Thirty-five converter ingots of the Hatfield sink-head type were sent to Sparrows Point, Md., and rolled into rails in comparison with 15 Maryland open-hearth ingots of the ordinary type used for making rails. The ordinary ingots were in 3 groups, each representing a distinct casting practice. A detailed chem., phys., and metallographic survey was made of the rails from all ingots rolled and of representative ingots and blooms. The investigation demonstrates the superiority of the sink-head type of ingot as to uniformity of properties of rails made from them, certainty of sound steel throughout and freedom from piping and undue segregation, and a greater portion of the ingot available for rails. F. W. COBB

Investigation of brass foundry flux. C. W. HILL, T. B. THOMAS AND W. B. VIETZ. *Pittsburgh. Metal Ind.* 18, 498-502(1920); *Mining and Met.* 1920, No. 165, 18.—Largely a general discussion. The results obtained from expts. on deoxidizers were not satisfactory owing to casting conditions, but phosphor-copper and boron carbide appear to be the best deoxidizers for Cu. As a whole the action of fluxes is more mechanical than chem. A. M. OWENS

Soldering with the metal spray gun. W. KASPEROWICZ. *Elektrochem. Z.* 27, Pt. 2, 27(1920).—The Schoop process was extended to the application of solder to metal surfaces that were to be joined together. Splendid results were obtained. Details are given. C. G. F.

Anti-corrosive preparations for iron and steel ("LATEX") 26. Effect of copper and silver salts on the corrosion of iron by acids (WATTS, KNAPP) 2. Electric furnace refractories (PIKE) 19. Platinum substitutes (ARNDT) 1. Protective coating for aluminium (GROTHUSS) 4.

GUILLET, LÉON: *La trempe et le revenu des produits métallurgiques*. Paris: Gaston Doin. 264 pp. 6 fr. For review see *Rev. ing. index tech.* 28, 210(1921).

L'HOEST, L. AND PRISARD, H.: *Le travail mécanique des métaux*. Paris: Ch. Béranger. 318 pp. 38 fr. For review see *Rev. ing. index tech.* 28, 209(1921).

VIAL, ETHAN: *Electric Welding*. New York: McGraw-Hill Book Co. 417 pp. \$4. For review see *Mech. Eng.* 43, 358(1921).

Promoter for ore flotation and separation. R. E. SAYRE. U. S. 1,370,843, Mar. 8. The concn. of sulfide or similar ores by flotation is facilitated by ketone condensation products such as can be obtained by condensing 2 mols. of acetone or other ketone by the use of HCl as a catalyst. These condensation products may contain mesityl oxide, phorone and higher homologs. If alk. condensation agents are used with acetone, the material contains mesityl oxide and unsatd. cyclic ketones such as isophorone. A suitable product for the purpose may also be obtained by heating acetone with  $\text{CaC}_2$ . Methyl ethyl ketone and other ketones yield suitable frothing compds. with condensation agents. As little as 2-3 oz. per ton of ore of the condensation products gives good results. Tests on ore of the Utah Copper Co. are given.

Filtering solutions from ore pulps or the like. D. P. HYNES. U. S. 1,373,887, Apr. 5. A pulp containing solid and colloidal substances, e. g., that obtained by leach-



ing Zn ore, is prepd. for filtration by adding a Zn compd. such as ZnO or Zn(OH)<sub>2</sub> to act upon the colloidal substances so that they will not interfere with filtration.

**Concentrating ores.** M. T. TAYLOR and J. W. PARTINGTON. Brit. 159,025, Nov. 21, 1919. In the concn. of ores by flotation, sulfonated fatty or resin acids are used as agents. Soaps, palm oil, or fatty acids obtained therefrom may be treated with strong H<sub>2</sub>SO<sub>4</sub> and the product may be used in the concn. process either alone, or in association with propyl, butyl, or amyl acetates or other esters, or alcohols, or pyridine, phenol, eucalyptus oil, or other substances. The provisional specification refers also to the use of fatty acids as agents.

**Treating ores.** TRENT PROCESS CORPORATION. Brit. 159,143, Feb. 4, 1921. Finely divided ores, slimes, etc., are sintered into a coherent mass against the walls of a furnace, and the mass so formed is further heated to smelt the ore. Air from a blower and a mixt. of fine ore, flux, and fuel from a hopper are fed through pipes to a rotatable furnace, means being provided for traversing the pipes through the furnace. The furnace is preliminarily heated by a torch, and the heating is thereafter maintained by the combustion of the fuel and ore, volatile products being withdrawn through a pipe. A deposit of sintered ore is formed which may be removed mechanically and smelted elsewhere, but is preferably smelted *in situ* by supplying air, or fuel and air, through pipes, the smelting being preferably stopped when there is still a thin unburned layer remaining on the walls. The furnace may be tilted about an axle to allow of continuous or intermittent discharge through an opening. During the smelting operation the atm. in the furnace may be oxidizing, neutral, or reducing, according to the materials treated and the products desired; the reduction of Fe<sub>2</sub>O<sub>3</sub> ores, and the formation of oxides of Fe and Zn from Fe-Zn sulfide ores are referred to.

**Treating sulfate solutions from ores.** C. R. HAYWARD, H. M. SCHLEICHER and F. O. STILLMAN. U. S. 1,370,646, Mar. 8. Ore such as soft Cuban Fe ore containing Ni, Mn and Cr is dried, preheated and subjected to a sulfating roast regulated to convert as much of the Ni and Al as possible into sol. sulfates and render sol. a portion of the Mn and Cr. The greater portion of the Fe is left in insol. form. The roasted material is then leached with hot H<sub>2</sub>O and during the leaching metallic Fe may be added to effect reduction in order to minimize the amt. of Fe pptd. with Al<sub>2</sub>O<sub>3</sub> and to facilitate the later production of a white gypsum. The leaching leaves a residue, which can be sintered to serve as a high-grade Fe ore, and a soln. contg. sulfates of Al, Fe, Ni, Mn and Cr. The soln. is treated with CaCl<sub>2</sub> to ppt. *gypsum*. The sepd. and washed ppt. is suitable for producing plaster of Paris or other commercial products. The chloride soln. remaining is treated with CaCO<sub>3</sub> to ppt. ferric Fe and trivalent Cr together with Al, leaving Ni, Mn and ferrous Fe in soln. The ppt. is removed, washed with CaCl<sub>2</sub> soln. and brine and is then suitable for the production of *alumina* by the Bayer process. Ferrous Fe in the soln. is oxidized and the Fe is pptd. and converted into a *pigment*. The soln. still containing Ni and Mn is treated with CaO to ppt. hydroxides of Mn and Ni, which are sepd. and washed. Nickel is recovered from this material by electrolytic refining.

**Refining metals and alloys.** H. C. HALL and ROLLS-ROYCE, LTD. Brit. 158,156, Feb. 25, 1920. A metal to be added to a molten metal bath for the purpose of making an alloy or cleansing, refining, or killing the molten metal or alloy, is introduced into the bath in a granulated and oil-coated condition. *E. g.*, a mixt. of 60 parts of Al, 30 parts of Zn, and 10 parts of Mg may be added in that condition to a bath of Al or other metal. A suitable app. is specified.

**Cleaning converter slag.** H. H. STOUT. U. S. 1,372,047, Mar. 22. Converter slag is cleaned of its Cu content by pouring the molten slag into reverberatory slag after formation in the converter of a slag of approx. the same sp. gr. and silica content as the reverberatory slag.

**Casting metals.** H. TALLA. U. S. 1,372,843, Mar. 29. Molten metals are subjected to explosive gas pressure as they enter the mold and to maintained gas pressure for a time thereafter in order to obtain non-porous castings.

**Metal powders.** W. P. HESKETT. Brit. 158,740, Nov. 21, 1919. Metal powders are obtained by the self-disintegration of alloys. 40% of Mn, 10% of Fe, 10% of Al, 5% of Sn, 15% of Zn, and 10% of Pb, or other combinations of some or all of the metals, Fe, Mn, Cu, Zn, Sn, Pb, Al, Sb, and Bi may be alloyed together, the product as it cools falling to powder.

**Ingot of different welded metals.** A. G. C. PITREUIL. U. S. 1,374,110, Apr. 5. Ferrous metal such as steel is welded to nonferrous metal such as brass through the assistance of an interposed thin sheet of Cu, which serves to combine with the Zn liberated from the brass on heating.

**Rotary metallurgical furnace.** F. DERNEDEN. U. S. 1,372,406, Mar. 22.

**Revolving furnace adapted for reducing iron ore.** L. P. BASSETT. U. S. 1,372,392, Mar. 22.

**Furnace for melting brass.** T. F. BAILY and F. T. COPE. U. S. 1,373,787, Apr. 5. A furnace adapted for melting brass is provided with a condenser in the upper portion of the heating chamber and this condenser has an inclined neck communicating with the heating chamber near the hearth of the furnace.

**Continuous heating-furnace adapted for heating metal billets or plates.** J. S. WORTH. U. S. 1,374,132, Apr. 5.

**Open-hearth furnace.** N. F. EGGER. U. S. 1,372,613, Mar. 22.

**Iron and steel manufacture.** J. J. LIKE. Brit. 157,705, Jan. 10, 1921. Oxidized titaniferous Fe of volcanic origin is treated in an elec. arc furnace without addition of reducing agents, the product being either titaniferous Fe, or a refined Fe or steel and a titaniferous by-product which may be used as a reducing or refining agent for Fe or steel.

**Iron and steel manufacture.** L. P. BASSETT. Brit. 158,523, Oct. 2, 1918. Fe ore is reduced by means of the exact quantity of C necessary, or by means of CO, and the resulting spongy Fe is melted in a flame consisting of CO produced by the combustion of finely divided C or other material such as crude petroleum, the proportion of petroleum to air being so detd. that at the temp. employed the H remains free, while the C burns to CO. The richness of the flame in C or O may be slightly varied in order to carburize or refine the metal. The ore mixed with C may be reduced in externally heated vertical or other retorts, from which the spongy Fe is discharged to a reverberatory furnace fed with flour C and air through a tuyère, part of the CO which is produced being utilized for heating the retorts and part for heating the air supply for the tuyère. After the metal has been melted in the furnace, the slag is run off and the metal is finished with additions of C, Mn, etc., or by means of an oxidizing flame. A suitable construction is specified.

**Iron and steel manufacture.** L. P. BASSETT. Brit. 157,397, Jan. 10, 1921. Addition to 158,523 (above). In modifications of the inventions described in the principal patent and in 130,610 the required amts. of C, and, in the case of special steels the metals such as W, Mo, Cr, etc., and, in the case of cast irons the elements such as Si, Mn, P, etc., are introduced into the molten bath of Fe.

**Iron and steel manufacture; alloys.** L. P. BASSETT. Brit. 157,398, Jan. 10, 1921. In a process for the direct production of Fe or steel, in the blast furnace, the necessary heat is furnished by the combustion of coal, etc., in a divided state which is projected into the lower part of the furnace by the air previously heated and proportioned in such a manner that the products of combustion consist practically only of CO and, in addition, H if the combustible contains it. In addition to the fluxes, a quantity of coal necessary to effect the chemical reactions, such as the reduction of the ferruginous cross-

es or the required carbonization of the Fe to form steel, is used. The process may be applied to the manuf. of Fe alloys such as ferromanganese, ferrosilicon etc. or to the treatment of all minerals reduced by CO and C. Cf. *C. A.* 15, 1132.

**Iron and steel manufacture; alloys.** W. CORSALLI. *Brit.* 157,944, Jan. 10, 1921. Scrap Fe or steel is melted with the addition of briquets of coke powder, anthracite, Fe oxides, Fe filings, oxides of Si or silicates, Mn ore, etc., bound by CaO cream, tar, molasses, etc., the process being carried out in shaft, hearth, or elec. furnaces. The briquets may be pressed by hand or by machinery and their compn. adjusted according to the special purpose for which they are intended. Broken castings, etc., may be used instead of the usual scrap iron. In one form of the process, scrap iron is mixed with molten pig iron in the furnace and the briquets in the desired quantity for carburizing are added. Iron ore mixed with Mn ore is then added to the iron bath if necessary. The reduction is effected by the C in the bath and after the reaction is complete the excess of slag is tapped off, the bath again carburized with briquets and more iron ore added. This is continued until the Fe bath has reached the desired size and the process can then be finished in any known manner.

**Seasoning steel articles after hardening.** B. H. BLOOD. U. S. 1,373,589, Apr. 5. Hardened steel articles are placed in a bath of oil which is slowly heated to about 150-230° and then permitted slowly to cool while the articles remain in it. The articles are then alternately repeatedly dipped in hot and cold baths. This treatment serves to effect seasoning without distortion.

**Removing scale from iron and steel.** J. SORENSON. U. S. 1,373,573, Apr. 5. Articles of Fe and steel are treated for the removal of scale by heating them to a high temp. while subjected to the action of an acid such as dil. HCl.

**Pickling.** BRITISH and FOREIGN CHEMICAL PRODUCERS, LTD. *Brit.* 158,768, Dec. 10, 1919. In a process for pickling Fe, steel, or Fe alloys, for the purpose of avoiding subsequent brittleness and tendency to rust, there is added to the pickling-liquor a small proportion of crude anthracene, sulfite lye, or residues from the production of naphthalene, and, in a modification, instead of or in addition to such a substance, there is added an ext. of the substance, an acid resin, waste acid from the refining of hydrocarbons, or a residue of the distn. of an org. compd. Active constituents accompanying the parent substance may be extd. by inorg. acids, neutral or acid salts, or org. solvents. The pickling may be conducted in the cold or with very little heating. The liquor can be used for removing rust, Zn, Sn, or other coatings from Fe, in the same manner as for pickling.

**Plating with steel.** H. HANEMANN. *Brit.* 157,225, Jan. 8, 1921. A layer of self-hardening steel is applied, preferably hot, to the surface of the metal to be covered. Metal objects such as axles, shafts, rollers, etc., may be plated by drawing on a sheath of the steel at 900-1100°. Quenching in H<sub>2</sub>O or oil is unnecessary. Steels containing Mn 3-5% and C 1.3-0.7% or Mn 2-3%, Ni 3-5%, and C 0.6-1.3% or Cr 2-5%, W 5-18%, and C 0.2-0.6%, or Ni 7% and C 0.6% are mentioned as examples. Other hardening metals like Mo or V may be used in known proportions. Cf. *C. A.* 15, 1132.

**Alloy steel.** A. PACZ. U. S. 1,373,908, Apr. 5. A steel containing W 4-8, Ta 3-6 and Cb 2-4% is adapted for making tools or other articles where hardness and toughness are desirable. Mo and Cr may also be used.

**Case-hardening.** H. RODMAN. U. S. 1,372,832, Mar. 29. Coked pitch is used as a case-hardening material. It may be mixed with Na<sub>2</sub>CO<sub>3</sub>, Ca(OH)<sub>2</sub>, or other "energizing" substances.

**Composition for restoring overheated tool steel.** V. MÜLLER. U. S. 1,372,364, Mar. 22. A mixt. for use in restoring "burnt" steel is formed of bone dust 10, charcoal 5, resin 2, KCN 2, borax 2 and a lubricant, e. g., codliver oil and tallow 30 parts.

**Case-hardening.** B. SCHÄFFER and G. BRITTSCHNEIDER. *Brit.* 157,839, Dec.

22, 1919. A case-hardening compn. for Fe and steel contains granulated brown coal and powdered limestone; pine-wood sawdust is added when the mixt. is used for tools.

**Case-hardening copper.** A. S. GUNDRASON. U. S. 1,372,423, Mar. 22. Cu is case-hardened by exposing its surface to the action of Zn at a temp. above the m.p. of Zn but below the m.p. of Cu.

**Treating mat.** G. HAGLUND. Brit. 158,887, Feb. 7, 1921. Ni-Cu mat is converted until the greater part of the Ni is reduced to metal, a portion of the mat is treated with acid in the presence of air, Cu is pptd. from the soln. by means of another portion of the mat, the Ni is recovered from the remaining soln., the undissolved residues of the dissolving and cementation processes are roasted, the resulting Cu and Ni oxides are leached with acid, the undissolved oxides reduced to metal and the precious metals are recovered. The metal reduced from the undissolved oxides may be used instead of mat for pptg. the Cu-Ni soln. in the earlier stage of the process; or the portion of the mat which is used for pptn. may be converted further than that which is treated with acid. Cf. 121,591.

**Treating tin scrap.** A. J. EVANS and H. D. EVANS. Brit. 158,926, Sept. 23, 1919.  $\text{ZnCl}_2$  and Sn are recovered from Sn-pot skimmings by grinding in a mill with 20-40% by wt. of a powdered mixt. of 3 parts of glass, 1 part of fluorspar and 1 part of feldspar, sufficient  $\text{H}_2\text{O}$  being added to form thin lumpy paste, filtering the  $\text{ZnCl}_2$  soln. obtained through a cloth-lined sieve, washing the remaining charge with  $\text{H}_2\text{O}$  until free from Cl, drying, adding dry powdered soda-ash by wt. not less than  $\frac{1}{2}$  of the wt. of glass previously used, and about 3% of the charge wt. of salt cake or niter cake, and smelting in a furnace. Ready-made slags, such as a Cu slag and the glassy parts of Fe blast-furnace slag in equal proportions, may be used for grinding and slagging. The glassy portions of the slag formed may be crushed and used again for grinding and the regulus of Sn is purified in the usual way.

**Tin and antimony.** H. B. BISHOP. Brit. 157,964, Jan. 12, 1921. Metalliferous materials such as mats, particularly white metal mats, tin ore, tin slag, slag from solder melting, or mixts. of ore, mat, or slags with other tin-bearing material are heated with niter cake or like sulfatizing material and with a reducing agent such as C, so as to convert all the metals into sulfides. The heating may be effected in a reverberatory furnace. The product is leached with  $\text{H}_2\text{O}$ . The insol. portion contains the Cu and Pb as sulfides and is practically a Cu mat. Sn and Sb are dissolved as thioantimonate and thioantimonate. The soln. may be electrolyzed to obtain metallic Sb, the Sn being then obtained as sulfide by acidulating the soln. and may be roasted to oxide and reduced to metal. Alternatively the mixed soln. may be treated with an acid and the Sb and Sn sulfides roasted to oxides and then reduced.

**Reducing chromium and other difficultly reducible metals.** H. C. P. WEBER. U. S. 1,373,038, Mar. 29. A mixt. of  $\text{CrCl}_3$  with Fe is heated to 700-1200° to produce metallic Cr and volatilize  $\text{FeCl}_3$ . If the Fe is sufficiently finely subdivided, and a relatively low temp. is employed for reduction, Cr is obtained in finely divided form. If solid pieces of Fe are used and the reaction takes place below the m. p. of the metals, a coating of Cr is formed on the pieces of Fe. If an excess of Fe is used and a sufficiently high temp. is employed, an alloy of Cr and Fe is produced. Chlorides of Cr and Ni may be similarly reduced together to form alloys or mixts. with each other or with Fe. Cr oxide may be employed and converted into chloride with C and Cl. The reduction process is advantageously carried out *in vacuo* or in an inert atm. such as N. Other refractory metal compds. may be similarly reduced and alloyed.

**Extracting silver from ores, etc.** P. R. MIDDLETON. U. S. 1,372,973, Mar. 29. The Ag content of Ag ores or residues is converted into sulfide by treatment with  $\text{H}_2\text{S}$  or alkali metal sulfide and the sulfide is then chlorinated in order to render the Ag sol.

**Recovering gold and silver from solutions.** R. H. MCKEE. U. S., 1,372,971, Mar.

29. Charcoal or other C which has been previously treated with NaOH or other alk. soln. and leached is used for treating solns. of Au and Ag in order to absorb the metals from the solns.

**Decarburizing tungsten and like metals.** LOHMANN-METALL GES. Brit. 157,780, Jan. 10, 1921. C is removed from W, U, and like metals by heating to a temp. approaching the m. p. of the metal either in an exhausted air-tight vessel or in a gas, especially H<sub>2</sub>, which withdraws the C from the metal previous to its melting.

**Apparatus for recovering mercury and other metals from gang.** J. HAVERLY. U. S. 1,372,137, Mar. 22.

**Low-carbon ferrotitanium.** H. C. SICARD. U. S. 1,374,035, Apr. 5. Low C ferro-Ti is produced by mixing commercial ferro-Ti with an excess of Ti oxide and heating the mixt. in an elec. furnace so as to decompose the double carbide of Fe and Ti and form a protective blanket of slag which consists mainly of Ti oxide.

**Low-carbon ferrotitanium.** H. C. SICARD. U. S. 1,374,036, Apr. 5. Low-C ferro-Ti is prepd. by treating a double carbide of Fe and Ti, containing a large % of C, in the form of a molten bath, with Al, to effect sepn. of graphitic C. The latter is skimmed off and the bath is reheated and cast.

**Low-carbon ferrozirconium.** H. C. SICARD. U. S. 1,374,037, Apr. 5. An alloy of Fe and Zr, low in C, is obtained by decarbonizing a high-C Fe-Zr alloy by the action of Ti oxide.

**Zirconium steel.** H. C. SICARD. U. S. 1,374,038, Apr. 5. Molten steel is treated with an alloy of Zr and Si, to form Zr steel.

**Tungsten and molybdenum carbides; tools; dies; bearings.** LOHMANN-METALL GES. Brit. 157,747, Jan. 10, 1921. Blocks, tools, dies, bearings, and other articles are made of W or Mo carbides or mixts. of them by finely grinding the fused carbide, molding it to the desired form in C molds, and then heating nearly to the m. p. for a sufficient length of time to cause a new process of crystn. throughout the mass.

**Tungsten and molybdenum carbides; tools; dies; bearings.** LOHMANN-METALL GES. Brit. 157,749, Jan. 10, 1921. Addition to 157,747 (above). In the production of tools and other articles of W or Mo carbides or mixts. of them as described in the principal patent, the powdered carbide is molded in Fe molds, and the heating to near the m. p. is effected in a reducing atm.

**Tungsten and molybdenum carbides.** LOHMANN-METALL GES. Brit. 157,750, Jan. 10, 1921. W and Mo carbides are obtained by fusing mixts. of C with W or Mo oxide in a carbon crucible in a carbon tube resistance furnace. It is stated that hitherto W carbide has been obtained in small quantities by heating W in a carbon crucible by the elec. arc, and that an imperfect carbonation or cementation occurs when W is heated in a C tube resistance furnace.

**Tool metal.** LOHMANN-METALL GES. Brit. 157,769, Jan. 10, 1921. Materials for tools, etc., is rendered very hard but ductile, by a process in which a non-carbon metal, e. g., Fe, Cr, Mo, Ti, or W is first cast and then worked to a fibrous structure by rolling, hammering, forging or pressing; carbon is subsequently introduced by ordinary cementation.

**Alloys.** LOHMANN-METALL GES. Brit. 157,774, Jan. 10, 1921. Hard alloys for tools and other purposes are made by combining Si and B with one or more metals such as Fe, W, Ti, Cr, Ni, and Mo; examples containing (1) equal proportions of Si, B, and W, and (2) 50 parts of Si, 50 parts of B, and down to 5 parts of W are referred to. The melting process is effected in the absence of O. The materials may be melted in a C crucible, any C taken up by the product being subsequently removed, or in a crucible lined with the most difficultly fusible constituent metal. The hardness of the product may be increased by mechanical working.

**Alloys.** J. E. HURST and E. B. BALL. Brit. 159,008, Nov. 18, 1919. A light

alloy, suitable for castings which are subjected to high temps. in use, comprises Al, 0.5-6% of Cr, and up to 6% of one or more other metals such as Zn, Mg, Cu, Ni, or Sh, the total amt. of these metals being preferably not more than that of the Cr. Up to 2% of elements such as Fe, Si, and Mn may be present as impurities. The alloys may be made by first prep. an Al-Cr alloy rich in Cr and adding this to the Al, the additional element or elements being preferably added in the form of Al alloys simultaneously with or subsequently to the Al-Cr alloy. According to provisional specification 28,546, 1919, the alloy may consist solely of Al and Cr.

**Alloys.** A. Pacz. Brit. 153,827, Jan. 26, 1921. Al alloys for making castings contain 5-25% of Si, preferably about 12.5%. The alloys may be made by melting together 1 part of commercial Si and 4 parts of Al and adding to the decanted molten product the remainder of the Al. The resulting alloy is refined by treatment with an alkali fluoride, with or without an alk.-earth fluoride; or a mixt. of  $\text{Na}_2\text{F}_2$  and NaCl may be used. Small amts. of other metals may be present in the alloys, the amt. of Fe preferably not exceeding 0.5%. An alloy of 92% of Al and 8% of Cu is also referred to.

**Alloys.** O. VON ROSTHORN. Brit. 158,882, Feb. 4, 1921. Cu alloys are made by adding to Cu an intermediate alloy and then adding an auxiliary alloy to compensate for losses of volatile metals and adjust the final compn. to that desired. The intermediate alloy may consist of 1.5 parts of Sn, 4.5 parts of Cd, and 3 parts of Cu, or 0.6 parts of Sn, 2.2 parts of Cd, and 1.5 parts of Cu, and may be added to a bath of molten Cu which has been treated with P or phosphor Cu. The auxiliary alloy may consist of equal proportions of Sn and Al, and of Sn and Mg, or of Sn and Cd.

**Alloys.** Soc. METALLURGIQUE DE LA BONNEVILLE. Brit. 157,872, May 29, 1920. A Cu-Zn-Ni alloy contains 25-45% of Cu; examples contain (1) 45% of Cu, 45% of Zn, and 10% of Ni and (2) 40% of Cu, 14% of Zn and 46% of Ni. A small proportion of Pb may be added to render the alloy more easily workable. A brass containing 50% of Cu and 5% of Ni also is referred to.

**Bearing-metal alloys.** T. GOLDSCHMIDT AKT.-GES. Brit. 158,562, Jan. 26, 1921. Bearing-metal alloys of high Pb content contain also P. The P may be introduced in the form of an alloy with one or more metals such as Cu, Mn, or Zn. Alloys containing 80% of Pb, 10-15% of Sh, 5-10% of Sn and a small proportion of Cu, are referred to.

**Alloys.** BRITISH THOMSON-HOUSTON CO., LTD. Brit. 157,988, Jan. 12, 1921. Malleable refractory alloys suitable for use in scientific instruments, jewellery, elec. contacts, etc., comprise at least 20% of Pt together with W or Mo or both, e. g., 20-60 parts of Pt and 30-40 parts of W. The alloys may be made by twisting together wires of the metals and melting them in the vapor arc furnace described in 26,082, 1912 (C. A. 8, 1547).

**Alloys.** BAKER AND CO., INC. Brit. 157,884, Nov. 24, 1920. A substitute for Pt-Ir consists of 5-15% of Au,  $\frac{1}{4}$ -5% of Ag,  $\frac{1}{4}$ -5% of Pd, and the remainder Pt.

**Treating metal surfaces.** BRITISH THOMSON-HOUSTON CO., LTD. Brit. 159,102, March 19, 1920. A surface alloy of Cr with a foundation metal such as Fe, Ni, Mo, or W, is produced by heating the metal in contact with powdered Cr at 1200-1500° and under non-oxidizing conditions. The Cr may be admixed with an inert material, such as  $\text{Al}_2\text{O}_3$  or  $\text{MgO}$ , and a current of H may be passed through the receptacle during the process; or the receptacle may be evacuated. Decarburizing occurs in the case of Fe, and the C may be restored or increased by heating in contact with C or hydrocarbon gas. Cf. 17,933, 1906 and 134,864.

**Coating metals.** J. THOMPSON, LTD., and H. E. BARTLEDGE. Brit. 158,010, July 25, 1919. In coating Fe, steel, Cu and other metals with Al, the cleaned surface is first coated with linseed or other oil, heated to burn off the oil, and again coated with

oil; powdered Al, with or without the addition of oil or flux, which may be  $\text{Be}(\text{NO}_3)_2$ , or of sand or other hard material, is then applied to the surface, and the article is heated to about  $1200^\circ \text{F}$ . After cooling, and removal of the oxide which has formed, the operations are repeated until a coating of the desired thickness is obtained. The surface is finally treated with oil and heated to burn off the oil. A thicker coating of Al may be obtained by sweating sheet Al on to an Al-coated surface obtained as described above.

**Coating aluminium with copper.** R. HURLBY. U. S. 1,372,290, Mar. 22. An aq. soln. of  $\text{ZnSO}_4$ ,  $\text{CuSO}_4$ ,  $\text{FeSO}_4$  and  $\text{H}_2\text{SO}_4$  is used for coating Al with Cu by mere immersion or by electrolysis.

**Coating copper on non-metals.** M. VOLMER. Brit. 157,379, Jan. 10, 1921. Non-metallic material is first provided with a thin coating of another metal, *e. g.*, silver, by any known method and is then copper-coated. The invention is applied to the making of Cu mirrors, a smooth transparent support, *e. g.*, glass, being first brought into contact with a silvering liquid to produce a non-reflecting, slightly visible deposit and then coated with Cu.

**Testing coatings on iron or steel.** A. S. CUSHMAN. U. S. 1,372,405, Mar. 22. The wt. of metallic coatings such as Zn on Fe or steel is detd. by applying HCl and  $\text{SbCl}_3$  to a definite integral portion of the coated surface and measuring the vol. of gas evolved by the action of the acid. An app. is described.

**Uniting metals by fusion.** RAIL WELDING and BONDING CO. Brit. 158,278, Jan. 19, 1921. Addition to 158,215. A flux used in fusion welding is carried by a semi-permanent holder of metal, fiber, paper, etc., coated with protective covering, so that the flux is protected from disintegration and from loss and premature dissipation under the welding flame or arc. A suitable construction is specified.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER

**Emil Fischer.** M. O. F. *Proc. Roy. Soc. (London)* 98A, 1-lvii (1921).—An outline of Fischer's work is given. E. H.

**The halogen-substitution reaction.** A. KRONSTEIN. Elektra-Lack-Werke, Karlsruhe. *Ber.* 54B, 1-16 (1921).—Although but few substitution reactions which yield homogeneous products are known these have been used in drawing up substitution laws. Thus, from the fact that in the Hell-Volhard-Zelinski method of halogenating acids,  $\alpha$ -monohalogen compds. are always formed, it was concluded that the  $\text{CO}_2\text{H}$  group directs the halogen in the substitution to the  $\alpha$ -position, in direct contradiction to the results obtained in the addition of halogen acids to acrylic acid where the halogen adds, at the  $\beta$ -position exclusively; moreover, Michael has shown that in sunlight substitution in the acids occurs in both the  $\alpha$ - and  $\beta$ -positions. That the halogen enters only the  $\alpha$ -position in the H.-V.-Z. reaction must, therefore, be due to the P used in the reaction and not to the directing influence of the  $\text{CO}_2\text{H}$  group. Nevertheless it was attempted to extend the results of the H.-V.-Z. reaction to the halogen-substituted aliphatic hydrocarbons on the assumption that the negative halogen already present, acting like  $\text{CO}_2\text{H}$ , would direct a second halogen, on further halogenation, to the  $\alpha$ -position, a deduction confirmed by Regnault, Städel and Denzel, who from  $\text{EtCl}$  and  $\text{Cl}$  obtained  $\text{MeCHCl}_2$ . Some 30 years later, however, it was found by Kronstein and by Victor Meyer that in the presence of Fe alkyl halides on further halogenation yield not ethylidene but pure ethylene substitution products. M. believed that there are no secondary reactions in these cases, the Fe acting purely as a catalyst, and explained the formation of  $\text{MeCHCl}_2$  from  $\text{EtCl}$ , as observed by Städel, by assuming secondary reactions of the type  $\text{EtB} \xrightarrow{\text{Br}_2} (\text{CH}_3\text{Br})_2 \xrightarrow{-\text{HBr}} \text{CH}_2=\text{CHBr} \xrightarrow{+\text{HBr}} \text{MeCHBr}_2$ . K. from

the very first, however, believed that the reaction in the presence of Fe is not a true substitution and that the catalyst is the  $\text{FeBr}_3$  formed on the surface of the Fe, splitting off halogen acid from the alkyl halide, with formation of an ethylene, which then adds 2 atoms of halogen in the usual way. But  $(\text{CH}_3\text{Br})_n$ , which is easily halogenated by direct substitution to  $\text{C}_n\text{Br}_{2n}$ , will not add a third Br atom in the presence of Fe, and when it was found that  $\text{CHBr}(\text{CH}_2\text{Br})_2$  and  $(\text{CHBrCH}_2\text{Br})_2$  can likewise not be further halogenated in the presence of Fe, K. was forced to the conclusion that only such halides can be further halogenated as contain a halogen-free C atom, a conclusion confirmed by the fact that  $\text{MeBr}$ , which easily yields  $\text{CHBr}_3$ , is not attacked by Br in the presence of Fe. Similarly, in the presence of P in the H.-V.-Z. reaction, the halogenation is still further limited, only monohalogen products being formed, which makes it probable that this, also, is not a substitution reaction, and is probably to be represented by the scheme  $\text{EtCO}_2\text{H} \xrightarrow{\text{PCl}_5} \text{EtCOCl} \xrightarrow{-\text{HCl}} \text{MeCH:CO} \xrightarrow{+\text{Br}_2} \text{MeCHBrCOBr}$ . In the case of the lower alkyl halides, the halide and the calcd. amt. of Br were heated in sealed tubes in the presence of Fe wire at  $80^\circ$  until colorless. When excess of Br was used the tubes were opened, the HBr was allowed to escape, the tubes were sealed again and reheated and the process was repeated until there was no further formation of HBr. With the halides of the isopentane group the expts. at  $80^\circ$  gave products with 2 Br atoms on one C atom but at temps. below  $5^\circ$  the reaction proceeded normally. In all cases the crude product was freed of halogen acid by washing with  $\text{H}_2\text{O}$ , taken up in  $\text{Et}_2\text{O}$ , dried and fractionated or recrystd.  $\text{CH}_3(\text{CH}_2\text{Br})_3$  decolorizes 1 mol.  $\text{Br}_2$  in the presence of Fe at  $80^\circ$  in 20 min. and yields a product,  $\text{CHBr}(\text{CH}_2\text{Br})_2$ , b.  $218-22^\circ$  to the last drop, also obtained from equimol. amts. of  $\text{MeCHBrCH}_2\text{Br}$  and  $\text{Br}_2$ , and from  $\text{PrBr}$  or  $\text{Me}_2\text{CHBr}$  with 2 mols.  $\text{Br}_2$ . *ps*-Butylene bromide (a mixt. of  $(\text{CHBrMe})_2$  and  $\text{EtCHBrCH}_2\text{Br}$ ), quickly decolorizes Br and yields a product, 53 g. of which gives 3 g. b.  $105-25^\circ$ , 13 g. b.  $125-40^\circ$ , 4 g. b.  $158-80^\circ$  and 34 g. b.  $175-80^\circ$ ; all 4 fractions contain approx. the amt. of Br calcd. for tetrahromobutane; the 2 main fractions, heated with Br, rearrange into the solid  $(\text{CHBrCH}_2\text{Br})_2$ , leaves from ligroin, m.  $118^\circ$ . When the bromination was carried out with an excess of Br there was obtained directly a solid product, sepd. by crystn. from ligroin into two tetrahromobutanes, m.  $118^\circ$  and  $39^\circ$ , resp. *Isobutylene tetrabromide*, from 11 g.  $\text{Me}_2\text{CBrCH}_2\text{Br}$  and Fe treated dropwise at room temp. with 16 g. Br and, after the evolution of HBr had ceased, heated 10 min. on the  $\text{H}_2\text{O}$  bath, is a heavy oil,  $b_1$ ,  $169-71^\circ$ . *Trimethylethylene bromide*, from  $\text{Me}_2\text{C}(\text{Et})\text{Cl}$  (A) and Br with or without Fe at room temp., also from  $\text{Me}_2\text{C:CHMe}$  and Br,  $b_1$ ,  $63-4^\circ$ . A with 2 mols.  $\text{Br}_2$  and Fe or  $\text{Me}_2\text{C}(\text{Et})\text{Br}$  (B) with 1 mol.  $\text{Br}_2$  reacts at once and the temp. of the mixt. rises above  $80^\circ$ ; the  $\text{Et}_2\text{O}$  soln. of the product leaves an oil from which a small amt. of crystals seps. The oil on fractionation yields, besides unchanged B, *unsym-tribromoisopentane* (C),  $\text{Me}_2\text{CBrCBr}_2\text{Me}$ ,  $b_1$ ,  $119-20^\circ$ , while the solid is  $\text{Me}_2\text{CBrCHBrCH}_2\text{Br}$ , crystals from alc., volatilizing completely at room temp.; this is formed almost exclusively if the bromination is carried out very slowly below  $5^\circ$  (48 hrs. were required to brominate 100 g. B); with 2 mols.  $\text{Br}_2$  it gives *pentabromoisopentane* (D),  $(\text{BrCH}_2)_2\text{CBrCHBrCH}_2\text{Br}$ , monoclinic crystals from alc., m.  $115^\circ$ . This with 1 mol.  $\text{Br}_2$  at  $80^\circ$  gives *hexabromoisopentane*,  $(\text{BrCH}_2)_3\text{CBrCBr}_2\text{CH}_2\text{Br}$  (E), yellowish white crystals from alc., m.  $90^\circ$ , and with 2 mols.  $\text{Br}_2$  *heptabromoisopentane*,  $(\text{BrCH}_2)_4\text{CBrCBr}_2\text{CH}_2\text{Br}$ , faintly yellow product from  $\text{PhNO}_2$  or  $\text{C}_6\text{H}_6$ , m.  $174^\circ$ . Unlike A,  $\text{Me}_2\text{CHCH}_2\text{CH}_2\text{Cl}$  (F) reacts with 1 mol.  $\text{Br}_2$  and Fe at room temp. only very slowly; at  $80^\circ$  the reaction is very energetic but considerable tar is formed; this can be in part avoided by working under a reflux instead of in sealed tubes and by adding the Br dropwise. The product consists of 75% unchanged F and 25% of the *tetrabromide*  $\text{Me}_2\text{CBrCBr}_2\text{CH}_2\text{Br}$ , faintly yellow oil,  $b_1$ ,  $148-50^\circ$ , smoothly converted by further bromination into E. With 3 mols.  $\text{Br}_2$  at  $0-5^\circ$ , F gives D. The constitution of C is established by the fact that on further bromination it gives E. Willstätter and Bruce (C. A. 2, 259) found, on applying K.'s



method to 1,2-dihromocyclobutane, that the ring is opened and there is formed a tetra-hromohutane,  $(\text{CH}_2\text{CHBr})_2$  or  $\text{BrCH}_2\text{CH}_2\text{CHBrCHBr}$ ; they were unable to decide with certainty which structure was correct but favored the former because on bromination of 1,2-dichlorocyclobutane they obtained what they believed to be a dichlorotetra-hromohutane (G), although it contained 11.94% C and 1.03% H (calcd. 10.84, 0.91). K. believes that the present work, in connection with W. and B.'s results, make the second formula more probable. The chlorohromo compd.,  $\text{BrCH}_2\text{CH}_2\text{CHClCHBrCl}$ , corresponding to this formula, might, under the influence of Br and Fe, first lose HBr to form  $\text{CH}_2=\text{CHCHClCHBrCl}$  or HCl to form  $\text{BrCH}_2\text{CH}=\text{CHCHBrCl}$  and these would then add  $\text{Br}_2$ , giving  $\text{BrCH}_2\text{CHBrCHClCHBrCl}$  (H) and  $\text{BrCH}_2\text{CHBrCHBrCHBrCl}$  (I). The presence of H was demonstrated by W. and B., while what they thought was G was really I (calcd., C 11.75, H 1.20%).

CHAS. A. ROULLER

The synthesis of cyanic acid and urea by oxidation of alcohols, phenols and aldehydes in ammoniacal medium. R. FOSSE AND G. LAUDR. *Compt. rend.* 172, 684-6 (1921).—Proteins,  $\text{NH}_3$  acids, carbohydrates,  $\text{C}_6\text{H}_5(\text{OH})_3$ ,  $\text{CH}_3\text{O}$ ,  $\text{HCONH}_2$  and  $\text{NH}_2\text{-COCO}_2\text{H}$  yield carhimide, and it may be produced when alcs., phenol and aldehydes are oxidized in the presence of  $\text{NH}_3$ . The yields of urea and carhimide vary within wide limits with the nature of substance, the oxidizing medium and with the conditions of the expt. The presence of a Cu salt or Cu powder increases the amt. of CNOH and of urea. When 100 cc. alc. were oxidized with  $\text{NH}_3$  the yield of urea was only 0.85 g. and when Cu was added the yield rose to 8.32 g. CNOH was obtained by treating  $\text{MeOH}$ ,  $\text{EtOH}$ ,  $\text{BuOH}$ ,  $\text{PhOH}$ ,  $\alpha\text{-MeC}_6\text{H}_4\text{OH}$ ,  $\alpha$ - and  $\beta\text{-C}_{10}\text{H}_7\text{OH}$ , pyrocatechol, resorcinol,  $\text{AcH}$ ,  $\text{PrH}$ , resp., with  $\text{KMnO}_4$  and  $\text{NH}_3$ . The data are tabulated. H. E. WILLIAMS

The action of epichlorohydrin on disodium phosphate in aqueous solution and on the stability of a diester of monoglycerophosphoric acid. OCTAVE BAILLY. *Compt. rend.* 172, 689-91 (1921).—This work was undertaken in an attempt to obtain a glycerophosphoric acid chlorohydrin (Cavalier, *Ann. chim. phys.* [7] 18, 481 (1898)), a compd. analogous to that obtained by the action of glycidol on  $\text{Na}_2\text{HPO}_4$ . When epichlorohydrin is added to 0.4 N  $\text{Na}_2\text{HPO}_4$  and the homogeneous soln. is allowed to stand at 18° it is found that the amt. of phosphate which can be pptd. diminishes and NaCl is set free in an amt. equiv. to the amt. by which phosphoric acid diminishes (phenolphthalein). The reaction which takes place in the soln. is complicated. No compds. were isolated but there is evidence of the great stability of the glycerophosphoric acid diester which is formed. These compds. are as a rule hydrolyzed with the greatest ease. Equations are given which account for the formation of the compds. considered to be present. Also in *Bull. soc. chim.* 29, 274-80 (1921).

H. E. WILLIAMS

The preparation of galactonic lactone. P. A. LEVENE AND G. M. MEYER. Rockefeller Inst. *J. Biol. Chem.* 46, 307-8 (1921).—The filtrate from the mixt. of the suspension of Ca galactonate and an equiv. wt. of  $(\text{CO}_2\text{H})_2$  is concd. *in vacuo* until crystn. begins. The crystals are dissolved by warming and the sirup is poured into HOAc. The lactone crystals with 1  $\text{H}_2\text{O}$ . The anhydrous lactone, obtained by crystn. from 99.5%  $\text{EtOH}$ , m. 112°.  $[\alpha]_D^{20} = -73^\circ$  immediately,  $-70.2^\circ$  after 96 hrs. and  $-63.7^\circ$  after 16 days.

I. GREENWALD

The melting point of diphenylamine. HOMER ROGERS, W. C. HOLMES AND W. L. LINDSAY. *J. Ind. Eng. Chem.* 13, 314-6 (1921).—After very careful purification of crude  $\text{Ph}_2\text{NH}$  (m. 51.7°) by distn. and crystn. principally from  $\text{MeOH}$ ,  $\text{EtOH}$  and petr. ether, two separate investigations gave a f. p. of 52.96° and 53°. The m. p. by the capillary tube method was 53°. The m. p. usually given in the literature is 54°.  $\text{PhNH}$  is highly sol. at room temp. in  $\text{Me}_2\text{CO}$ ,  $\text{CS}_2$ ,  $\text{CCl}_4$ ,  $\text{Et}_2\text{O}$ ,  $\text{C}_6\text{H}_6$ ,  $\text{PhMe}$ ,  $\text{C}_6\text{H}_5\text{Me}$ ,  $\text{PhNH}_2$  and  $\text{PhNO}_2$ ; in  $\text{MeOH}$ ,  $\text{EtOH}$ , iso- $\text{PrOH}$ ,  $\text{BuOH}$ ,  $\text{PhNMe}_2$  and  $\text{AcOH}$ , 20 to 40% will dissolve at room temp., while the paraffin hydrocarbons will dissolve less than 20%.

GEO. W. STRATTON

Crystalline form of 2,4-dichloro-3-nitroacetanilide. MARIA DE ANGELIS. *Atti accad. Lincei* 29, I, 247-51 (1920).—This compd. is dimorphous; both the  $\alpha$ - and  $\beta$ -modifications form crystals belonging to the prismatic class of the monoclinic system; for the former,  $a:b:c = 1.1507:1.11348$ ,  $\beta = 66^\circ 23'$ , and for the latter,  $a:b:c = 1.5792:1.10952$ ,  $\beta = 62^\circ 23.5'$ . J. C. S.

Crystalline form of 2,4-dibromo-3-nitroacetanilide. MARIA DE ANGELIS. *Atti accad. Lincei* 29, II, 47-53 (1920); cf. preceding abstr.—This compd. is not isomorphous with the corresponding di-Cl compd., but forms crystals, d. 2.131, belonging to the pinacoidal class of the triclinic system,  $a:b:c = 1.2526:1:1.0013$ ,  $\alpha = 96^\circ 54'$ ,  $\beta = 104^\circ 39'$ ,  $\gamma = 108^\circ 35'$ . Mixts. of the di-Cl and the di-Br compds. form monoclinic crystals completely isomorphous with those of the  $\beta$ -modification of the di-Cl deriv. J. C. S.

Catalytic reduction of *o*-nitroazoxybenzene. GUIDO CUSMANO. *Atti accad. Lincei* 29, II, 93-5 (1920).—When an  $\text{Et}_2\text{O}$  soln. of *m,m*-dinitroazoxybenzene, contg. Pt black in suspension, is shaken at the ordinary temp. in an atm. of  $\text{H}_2$ , the gas is rapidly absorbed, with formation of various reduction products, principally *o*-aminoazoxybenzene,  $\text{NH}_2\text{C}_6\text{H}_4\text{N}:\text{NPh}\cdot\text{O}$ , which crysts. in long, flattened prisms, m.  $97^\circ$ , forms colorless, well crystd. salts with  $\text{HCl}$  and  $\text{H}_2\text{SO}_4$ , and yields an acetyl derivative, m.  $157^\circ$ . When heated on a boiling-water bath with concd.  $\text{H}_2\text{SO}_4$ , it does not undergo Wallach's transposition, according to which azoxybenzenes are converted into the isomeric hydroxyazo compds., but it suffers intramol. dehydration, with formation of 2-phenyl-

1,2,3-benzotriazole,  $\text{C}_6\text{H}_5\text{N}_3$  or  $\text{C}_6\text{H}_4\text{N}_3\text{NPh}$ . The detailed results are to be published later. J. C. S.

Synthesis of 3,5-dimethoxybenzaldehyde. F. MAUTHNER. *J. prakt. Chem.* 100, 176-82 (1920); *J. Chem. Soc.* 120, I, 32.—*m*-Dimethoxybenzyl Alcohol (needles, m.  $47-8^\circ$ ) can be most conveniently prep'd. from the aldehyde and  $\text{KOH}$ , but is also formed by reduction of the corresponding amide (cf. Guareschi, *Gazz. chim. ital.* 4, 465 (1875); Max, *Ann.* 263, 249 (1891)). On electrolytic reduction in alc.  $\text{H}_2\text{SO}_4$  it yields the ethyl ether,  $\text{C}_{11}\text{H}_{16}\text{O}_4$ , b<sub>11</sub>  $156-8^\circ$  (cf. Mettler, *Ber.* 38, 1745 (1905)). 3,5-Dimethoxybenzaldehyde, prep'd. by reducing the acid chloride in  $\text{C}_6\text{H}_5\text{Me}_2$  with  $\text{Pd}-\text{BaSO}_4$  at  $140^\circ$ , crystals, m.  $45-6^\circ$ ; *p*-nitrophenylhydrazone, red needles, m.  $183-4^\circ$ ; oxime, needles, m.  $119-20^\circ$ ; semicarbazone, needles m.  $177-8^\circ$ . 3,4-Dimethoxyphenyl 3,5-dimethoxystyryl ketone, prep'd. by condensing the aldehyde with acetylveratrone in the presence of  $\text{NaOH}$ , m.  $103-4^\circ$ , yellow needles. D. BRESSE JONES

Amino alcohols derived from  $\alpha$ -anilino- $\gamma$ -dialkylaminoisopropyl alcohols. E. FOURNEAU AND J. RANEDO. *Anal. fis. quim.* 18, 133-9 (1920).—The physiol. effect of the replacement of a  $\text{PhO}$  by a  $\text{PhNH}$  group in amino alcs. derived from  $\text{PhNH}_2$  and its homologs was investigated. The aromatic amine was made to react with epichlorohydrin, and the deriv. thus obtained treated with  $\text{NHMe}_2$  or one of its homologs. The following substances are described:  $\alpha$ -*p*-phenetidino- $\gamma$ -dimethylaminoisopropyl alcohol,  $\text{EtOC}_6\text{H}_4\text{NHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{NMe}_2$ , b<sub>14</sub>  $212^\circ$ , m.  $79^\circ$ ;  $\alpha$ -*p*-toluidino- $\gamma$ -dimethylaminoisopropyl alcohol,  $\text{C}_6\text{H}_4\text{MeNHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{NMe}_2$ , b<sub>12</sub>  $190^\circ$ , m.  $72^\circ$ ;  $\alpha$ -methylanilino- $\gamma$ -dimethylaminoisopropyl alcohol,  $\text{NMePhCH}_2\text{CH}(\text{OH})\text{CH}_2\text{NMe}_2$ , b<sub>14</sub>  $168^\circ$ ;  $\alpha$ -anilino- $\gamma$ -dimethylaminoisopropyl alcohol, b<sub>11</sub>  $195^\circ$ , m.  $84^\circ$ ;  $\alpha$ -ethylanilino- $\gamma$ -dimethylaminoisopropyl alcohol, b<sub>11</sub>  $195^\circ$ ;  $\alpha$ -*m*-nitroanilino- $\gamma$ -dimethylaminoisopropyl alcohol, m.  $95^\circ$ ; and  $\alpha$ -*o*-anisidino- $\gamma$ -dimethylaminoisopropyl alcohol, b<sub>14</sub>  $198-200^\circ$ . The anesthetic action of benzoylmethylanilino dimethylaminoisopropyl alc. hydrochloride is slower than that of stovaine; total anesthesia is obtained in 20 min. with 0.02 *N* solns., and in 17 min. with 0.04 *N* solns.; 0.04 *N* stovaine solns., on the other hand, act in 4 to 5 min. J. C. S.

**Syntheses of inactive ephedrine or  $\psi$ -ephedrine.** A. EBERHARDT. *Arch. Pharm.* 258, 97-129(1920); *J. Chem. Soc.* 118, I, 875-6.—Assuming the correctness of Schmidt's formula,  $\text{HOCHPhCHMeNHMe}$ , for these alkaloids, E. succeeded in synthesizing inactive ephedrine and  $\psi$ -ephedrine (which have not thus far been obtained from the natural bases) in such quantity that their resolution can now be studied. The method finally adopted is an improvement of that proposed by Schmidt and Callies (cf. *C. A.* 5, 1271, 2822). *Methylation of phenyl  $\alpha$ -aminoethyl ketone or phenylaminoethylcarbinol.*  $\text{PhCH(OH)CHMeNH}_2(\text{A})$  is slowly converted by  $\text{Me}_2\text{SO}_4$  at  $100^\circ$  into a substance, shining needles and leaflets, m.  $244^\circ$ , apparently having the constitution,  $\text{O.CHPH-}$

$\text{CHMe.NH}_2\text{O.SO}_3$ , and being analogous to the products obtained by Schmidt (cf. *C. A.*

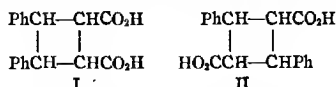
8, 3779) by the action of  $\text{H}_2\text{SO}_4$  on ephedrine and  $\text{Ag}_2\text{SO}_4$  on  $\psi$ -ephedrine. Various attempts to methylate the free base with  $\text{Me}_2\text{SO}_4$  are described, which, however, are either completely unsuccessful or yield such small amts. of methylated substance that its identity cannot be established. Similarly, the action of  $\text{Me}_2\text{SO}_4$  on  $\text{PhCOCHMe.NH}_2$  (B) proceeds very indefinitely, but does not give rise to a betaine-like deriv., for the formation of which the presence of a OH group in the parent mol. appears to be necessary. A. HCl is unaffected by MeOH at  $170-80^\circ$ . The main product of the action of MeI on B is diphenyldimethylpyrazine, needles, m.  $125^\circ$ , the decompn. of the ketone proceeding far more rapidly than its methylation. The substance is further identified by conversion into its unstable hydrochloride, chloroplatinate, *chloroaurate*, yellow leaflets, m.  $115^\circ$ , *chloromercurate*, plates and flat needles m.  $193-5^\circ$  after softening at  $180^\circ$ , and its *silver nitrate compound*,  $\text{C}_{16}\text{H}_{16}\text{N}_2.2\text{AgNO}_3$ , slender shining needles, m.  $247^\circ$  (decompn.). MeI appears to be without action on the *acetyl derivative* or A or on mono- or dihenzoilphenylaminoethylcarbinol [the latter m.  $165^\circ$  instead of  $162^\circ$ , recorded previously (cf. *C. A.* 11, 3255), and yields a *hydrochloride*, needles, m.  $203^\circ$  after previous softening]. A satisfactory methylation could not be effected by the action of  $\text{CH}_3\text{O}$  on A.HCl. B does not react readily with BzH, while the product obtained from A under similar conditions could not be made to crystallize. Treatment of the crude product with MeI, however, gave a small quantity of  $\text{PhCH(OH)CHMeNHMe.HI}$ , plates, m.  $169-70^\circ$ , which was further characterized by its conversion into the corresponding *chloroaurate* m.  $111.5^\circ$  after softening at  $108^\circ$ . *Syntheses from methylamine and phenyl bromoethyl ketone.*  $\text{PhCOCHMeNHMe}$  is more conveniently prepd. from  $\text{MeNH}_2$  and  $\text{PhCOCHMeBr}$  in abs. alc. than in  $\text{C}_6\text{H}_6$ , as previously described (cf. *C. A.* 10, 193), being isolated as the hydrochloride; the latter is readily reduced by H under slight pressure in the presence of Pd charcoal to  $\text{PhCH(OH)CHMeNHMe}$ , m.  $114^\circ$ , the process being much preferable to the reduction with Na-Hg described previously (*l. c.*); the hydrochloride thus obtained differs from the former compd. in its higher m. p.,  $187^\circ$ , instead of  $181-2^\circ$ , and its more sparing soly. It is further found that, in addition to the compd. m.  $114^\circ$ , an isomeric substance, slender needles, m.  $76^\circ$ , also exists, and these are provisionally termed bases B and A. They yield, resp., the *hydrochlorides*, readily sol., ill defined crystals, m.  $158-61^\circ$ , and colorless rhombic plates, m.  $187^\circ$ ; *chloroaurates*, flat needles, m.  $115-6^\circ$ , and then yellow plates or golden yellow lamellas, m.  $115^\circ$ , *chloroplatinates* reddish yellow crusts, m.  $177^\circ$  (decompn.), and yellowish red rosettes, m.  $183^\circ$  (decompn.), *dibenzoil derivatives*, coarse colorless crystals, m.  $118-9^\circ$ , and colorless rods, m.  $114-5^\circ$ . The *acetyl derivative* from either isomeride is oily, but yields a *cryst. hydrochloride*, colorless plates, m.  $165-7^\circ$ . The synthetic compds., their salts, and derivs. show great similarity to the natural bases, both in appearance and m. p., which is particularly noticeable in the case of the B-base and  $\psi$ -ephedrine. The bases A and B exhibit an interconvertibility precisely similar to that of ephedrine and  $\psi$ -ephedrine. This can be partly effected by

HCl at the ordinary pressure, but more readily at higher temp. and under increased pressure, while the base A is completely converted into base B by acetylation, a change not observed on benzoylation. Transformation does not take place when base A is heated alone in the presence of alkali or of a number of solvents; with  $\text{CHCl}_3$ , the hydrochloride is formed as a result of the decompn. of the solvent. W. O. E.

**Nitro derivatives and nitrohydrazones.** II. R. CRUSA AND L. VECCHIOTTI. *Atti accad. Lincei* 29, II, 42-7 (1920); cf. *C. A.* 6, 624; 14, 2173, 3231.—The tendency of the phenylhydrazones of aromatic nitro aldehydes to furnish chromo-isomerides is exhibited to an enhanced degree by the nitrophenylhydrazones. As regards the cause of this isomerism, it has been found previously (*C. A.* 6, 353) that, whereas  $\text{PhCH:N:NHPh}$  (1 mol.) forms an additive compd. with 2 mols. of picryl chloride, each of the phenylhydrazones of the 3 nitrobenzaldehydes unites with only 1 mol. of the chloride, although  $\text{PhCH:NNHC}_6\text{H}_4\text{NO}_2$  unites with 2 mols. The conclusion is drawn that the points of attack in the mols. of  $\text{C}_6\text{H}_3(\text{NO}_2)_3$  and its derivs. are the Ph group of the aldehyde and the iminic N atom. In order to test this conclusion, additive compds. of  $\text{PhCH:NNHPh}$  with 2 different  $\text{C}_6\text{H}_3(\text{NO}_2)_3$  derivs. have been prepd. with the hope of obtaining 2 such isomerides as— $\text{C}_6\text{H}_2\text{Cl}(\text{NO}_2)_3 \cdots \cdots \text{CHPh:NNHPh} \cdots \cdots \text{C}_6\text{H}_2\text{Me}(\text{NO}_2)_3$  and  $\text{C}_6\text{H}_2\text{Me}(\text{NO}_2)_3 \cdots \cdots \text{CHPh:NNHPh} \cdots \cdots \text{C}_6\text{H}_2\text{Cl}(\text{NO}_2)_3$ ; as yet, no such isomerides have been obtained. The possibility that in the chromo-isomeric nitrophenylhydrazones the  $\text{NO}_2$  group is united internally by secondary valencies either to the iminic N atom or to the Ph group of the aldehyde, is also discussed. The exptl. results obtained are to be published separately. J. C. S.

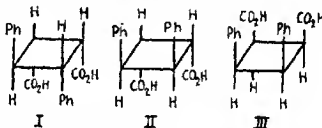
**Certain salts with *p*-, *o*-, and *m*-quinonoid structure.** II. R. CRUSA. *Atti accad. Lincei* 29, II, 146-50 (1920); cf. *C. A.* 14, 2173, 3231.—Benzoylformaldehyde *p*-nitrophenylhydrazone, obtained by heating benzoylglyoxylic acid *p*-nitrophenylhydrazone at its m. p., gives, when treated in xylene with alc. KOH, the compound  $\text{C}_{20}\text{H}_{15}\text{O}_4\text{N}_3\text{K}_2$ , which forms blue crystals with a golden reflection. Treatment of this K deriv. with dil.  $\text{H}_2\text{SO}_4$  yields the compound,  $\text{NO}_2\text{C}_6\text{H}_4\text{NHN:C(Bz)C(Bz):NNH}_2$ , which crystallizes in golden yellow, shining plates, m. 199°. Benzoylformaldehyde *o*-nitrophenylhydrazone also yields a similar potassium salt,  $\text{C}_{20}\text{H}_{15}\text{O}_4\text{N}_3\text{K}_2$ , crystallizing in blue plates with a golden yellow reflection. As was shown by Angeli, *o*- and *p*-substituted compds. of the type  $\text{R.C}_6\text{H}_4\text{R}$  behave similarly to those of the form  $\text{R.R}$ , since they react as if the  $\text{C}_6\text{H}_4$  nucleus were non-existent. The formation of the compd.  $\text{C}_{20}\text{H}_{15}\text{O}_4\text{N}_3$  may result from the decompn. of 1 mol. of benzoylformaldehyde *p*-nitrophenylhydrazone, similarly to the decompn. of nitrohydroxylaminic acid,  $\text{CHBz:NN:C}_6\text{H}_4\text{:NO}_2\text{K} \rightarrow \text{CH:Bz:NN:} + \text{Ph.NO}_2$ , and subsequent union of the residue,  $\text{CHBz:N.N:}$ , with a second mol. of the nitrophenylhydrazone. Hydrolysis of the K deriv. of benzaldehyde *p*-nitrophenylhydrazone (*loc. cit.*) by means of dil.  $\text{H}_2\text{SO}_4$  yields the original nitrophenylhydrazone itself, and the same occurs with the potassium compound of dimethylamino-benzaldehyde *p*-nitrophenylhydrazone,  $\text{C}_{18}\text{H}_{19}\text{O}_2\text{N}_4\text{K}$ , which forms violet scales with metallic reflection. The sodium salt of benzaldehyde *p*-nitrophenylhydrazone forms a violet powder; the Rh, Li, and Ca salts exist in soln., but readily undergo hydrolysis, and are difficult to obtain pure. Since on addition of alc. KOH to the 3 nitrobenzaldehyde phenylhydrazones in acetone an intense green color appears, it is assumed that salt-formation occurs, with formation of a quinono-nitronic acid, at the expense of the aldehydic H atom:  $\text{NO}_2\text{C}_6\text{H}_4\text{CH:NNHPh} \rightarrow \text{NO}_2\text{H:C}_6\text{H}_4\text{:C:NNHPh}$ . Such salts are of interest, as they contain the grouping  $\text{:C:C:N.NK}$ , analogous to that of the hydrazenes, and are, indeed, related to the hydrazenes in the same way as the quinoketenes are to the ketenes. The alkali salts of these hydrazones appear to exist only in soln., but from *p*-nitrobenzaldehyde *p*-nitrophenylhydrazone, mono- and dipotassium salts have been prepd.; both the monopotassium salt,  $\text{NO}_2\text{C}_6\text{H}_4\text{CH:NN:C}_6\text{H}_4\text{NO}_2\text{K}$ , and the dipotassium salt,  $\text{KNO}_2\text{:C}_6\text{H}_4\text{:C:NN:C}_6\text{H}_4\text{NO}_2\text{K}$ , form brown, cryst. powders. J. C. S.

(Truxillic acids.) III. Natural and artificial truxillic and truxinic acids. R. STÖRMER AND E. LAAGE. Univ. Rostock. *Ber.* 54B, 77-85(1921); cf. *C. A.* 14, 3073.—The discovery of a 7th truxillic acid (see Paper V below) renders untenable the possibility suggested by Stohbe (*C. A.* 13, 3190) and also considered by Stoermer and Foerster (*C. A.* 14, 58) that, as only 6 acids were known, they might all be stereoisomers of the structure I, of which 6 are possible, and that none had the structure II, of which



5 stereoisomeric forms are possible. There being thus justification for accepting the formula II, the total number of possible isomeric truxillic acids is 11, and to avoid confusion by merely designating them all as "truxillic acids" with a prefixed Greek letter, it is proposed to call only those of type II "truxillic acids" and those of type I "truxinic acids" (rather than isotruxillic acids, as previously suggested). Those already known shall retain their present Greek letter prefixes (although those of type I might be called betruxinic, deltruxinic, zetruxinic instead of  $\beta$ -,  $\delta$ -,  $\zeta$ -truxinic, resp.), but new ones shall receive different prefixes; thus, the 7th, just discovered, is called neotruxinic acid. The opinion has often been expressed that the cleavage acids from the minor alkaloids of *Erythroxylon coca*, insofar as they consist of truxinic and truxillic acids, are produced in the plants by polymerization of *cis*- or *trans*-cinnamic acid by sunlight, a view supported by expts. according to which the *trans*-acid gives  $\alpha$ -truxillic, the *cis*-acid  $\beta$ -truxinic acid. S. and L. have now carried out on a larger scale expts. (first made by Riiber, *Ber.* 35, 2908(1902)) on the photopolymerization of stable cinnamic acid and have found that not only  $\alpha$ -truxillic but also a smaller amt. of  $\beta$ -truxinic and some  $\epsilon$ -truxillic acid are formed. de Jong has recently (*C. A.* 14, 1969) found, in addition,  $\gamma$ -truxillic,  $\delta$ -truxinic and a new acid, m. 230°; these results are probably to be ascribed to the greater intensity of the tropical sun at Buitenzorg. S. and L. from a total of 443 g. cinnamic acid exposed to sunlight obtained 288 g.  $\alpha$ -truxillic, 4.3 g.  $\beta$ -truxinic and 0.5 g.  $\epsilon$ -truxillic acid, the rest consisting of unchanged cinnamic acid, resinification products and BzH. The formation of the  $\beta$ -truxinic acid is probably to be explained by a rearrangement of a small portion of the stable cinnamic acid by the sunlight into the allo acid, which then undergoes the polymerization. The procedure followed was briefly this: the illuminated mixt. of acids was extd. with  $\text{Et}_2\text{O}$  and alc., leaving the  $\alpha$ -acid almost completely undissolved; the residue from the exts. was converted into the Me esters, the Me cinnamate removed with steam, the truxillic and truxinic esters remaining distd. in a high vacuum to free them from tarry impurities and sapond. with alc. KOH and the difficultly sol. K  $\beta$ -truxinate sepd. from the more easily sol.  $\epsilon$ -truxillate. There was also observed an oily, unidentified acid. S. and L. also examd. a large lot of crude natural truxillic acids obtained in working up the minor alkaloids of the Peruvian coca plant; the amts. of the individual acids which can be isolated from the crude mixt. vary considerably with the way of working it up. In the most favorable case they obtained from 400 g. of the com. product 100 g.  $\alpha$ - and 17 g.  $\epsilon$ -truxillic and 116 g.  $\beta$ -, .40 g.  $\delta$ - and 0.5 g. neotruxinic acid. Although their failure to obtain  $\gamma$ -truxillic and  $\epsilon$ -truxinic acid does not exclude the possibility of their presence in the crude mixt. they believe these two acids could hardly have escaped them, had they been present, and from their absence or presence in only very small amt., as well as the  $\epsilon$ -truxillic and neotruxinic acids, they think these 4 acids are formed by the mutual polymerization of 1 mol. each of *cis*- and *trans*-cinnamic acid while the  $\alpha$ -truxillic acid is formed exclusively from the *trans*-acid and the  $\beta$ - and  $\delta$ -truxinic acids exclusively from the *cis*-acid. AcOH (100 g.) at 20° dissolves 0.3174 g.  $\alpha$ -, 4.310 g.

$\delta$ - and 22.96 g.  $\epsilon$ -truxillic acid. IV. The 6th acid of the truxillic acid group,  $\zeta$ -truxinic acid (zetruxinic acid). R. STORMER AND F. SCHOLTZ. *Ibid* 85-86.—It had already been mentioned that  $\epsilon$ -truxinic acid can be rearranged into a new acid,  $\zeta$ -truxinic acid (A). The guiding thought in these rearrangement expts. was that Liebermann's  $\delta$ -truxinic acid, from its method of formation by KOH fusion from  $\beta$ -truxinic acid, must be a *trans*-dicarboxylic acid which on anhydridization with  $\text{Ac}_2\text{O}$  need not necessarily regenerate the  $\beta$ -acid. This expectation was confirmed and the present work shows with certainty that the  $\delta$ -acid is a *trans*-form and that the anhydride formed from it gives on hydrolysis a *cis*-acid of the same mol. wt. as the other truxinic acids, which by KOH fusion or by heating with HCl in sealed tubes gives back the  $\delta$ -acid. The new acid (A) is possibly identical with that, m. 230°, obtained by de Jong and named by him  $\epsilon$ -truxillic acid (*loc. cit.*). Of the three possible *cis*-truxinic acids, two are *meso*- and only one (I) is a *dl*-form, and as A can be resolved into optical antipodes with cinchonine it must have the structure I. There remain, then, for the  $\beta$ -acid the structures II or III;



III had previously been given the preference but S. and S. now incline to II; a compd. of the type III, with four radicals on one side of the plane, should be relatively labile and, moreover, would be expected to form a truxone. II, at the first glance, does not seem to harmonize with the photopolymerization of *ortho*-cinnamic acid, but when it is remembered that the polymerization is merely an addition at the double bonds and that this occurs primarily at the *trans*-positions, structure II gains in probability. The  $\delta$ -truxinic acid was prepd. from the  $\beta$ -acid by Liebermann's method (*Ber.* 22, 2250 (1889)) except that 8 parts KOH were used and the melt was not heated to such a temp. that it turned brown; it can also be obtained almost quant. by heating the  $\beta$ -acid 6 hrs. at 160° with concd. HCl in sealed tubes. Crystd. from dil. MeOH or a mixt. of 35 cc.  $\text{C}_6\text{H}_6$  and 15 drops  $\text{AcOH}$ , it m. 176°. The rearrangement into A is best effected by heating 3 g. of the  $\delta$ -acid with 3 parts  $\text{Ac}_2\text{O}$  at 160°, treating with excess of concd. NaOH, dissolving the pptd. Na salt in  $\text{H}_2\text{O}$ , pptg. the A with HCl, boiling several hrs. in  $\text{Me}_2\text{CO}$  with charcoal and crystg. from dil.  $\text{Me}_2\text{CO}$  or a mixt. of  $\text{Me}_2\text{CO}$ , a little  $\text{AcOH}$  and  $\text{H}_2\text{O}$  until it m. 239°; it seps. in small needles, mol. wt. in boiling alc. 310; 100 g.  $\text{AcOH}$  at 20° dissolve 1.134 g.  $\beta$ -, 10.382 g.  $\delta$ - and 1.164 g.  $\zeta$ -acid; 50%  $\text{Me}_2\text{CO}$  at 20° 2.469 g.  $\beta$ - and 2.343 g.  $\zeta$ -acid. Boiled 0.5 hr. under a reflux with HCl in MeOH, the  $\beta$ - and  $\delta$ -acids are completely esterified while A gives only a little of the mono-Me ester. A regenerates the  $\delta$ -acid when heated 6 hrs. at 140° in sealed tubes with concd. HCl or when fused with KOH. Dimethyl ester of A, from A warmed with  $\text{Me}_2\text{SO}_4$  and soda, crystals from alc., m. 116°, also obtained by heating A in  $\text{Et}_2\text{O}$  with  $\text{CH}_3\text{N}_3$  or by boiling it in MeOH with HCl; in the last case, if the product is extd. with soda and the ext., after the removal of the di-Me ester with  $\text{Et}_2\text{O}$ , is acidified, there is obtained the monomethyl ester, m. 168°. Diethyl ester, felted needles, m. 80°; monomethyl ester, crystals from dil. alc., m. 190°. Of the salts of A, the calcium and barium salts are almost insol. in cold  $\text{H}_2\text{O}$ , the ammonium and potassium salts almost insol. in alc. The K salt seps. in long needles, the  $\text{NH}_4$  salt in needles, decomp. about 160°. Anhydride, from A heated 2 hrs. at 140-50° with  $\text{Ac}_2\text{O}$ , m. 150°, insol. in cold soda, stable towards  $\text{H}_2\text{O}$ , reforming A only after 45 min. boiling, much less stable towards alc., giving the mono-Et ester after short heating. Heated 4 hrs. with 2 parts  $\text{PhNH}_2$ , it yields the anil, fine needles from alc., m. 180°, insol. in dil. alkali, hydrolyzed by long boiling with alc. KOH; if allowed to stand only a short time in cold alc. KOH it forms the anilidic acid, m. 209°, also obtained by cautiously warming the anhydride with  $\text{PhNH}_2$  at 140°. If the anhydride is heated with 1.5 parts  $m\text{-C}_6\text{H}_4(\text{OH})_2$  to 220°, the melt

soon assumes a deep red-brown color and dissolves in soda or  $\text{Ba}(\text{OH})_2$  with green fluorescence, indicating the formation of *l-truxinic-fluorescein*, which; however, was not isolated pure. The  $\text{NH}_4$  salt, tightly packed into a narrow tube, plunged into a bath at  $170^\circ$  and heated 15 min. at  $200-10^\circ$ , pptd. from  $\text{C}_6\text{H}_6$  with petr. ether and treated with soda to remove free acid, yields the *imide*, fine needles from alc., m.  $168-8.5^\circ$ , insol. in cold soda but sol. on heating and depositing on cooling a fine ppt., probably of the Na salt, which dissolves clear in much  $\text{H}_2\text{O}$ ; short treatment with alc. NaOH does not affect the imide but if 0.4 g. is allowed to stand 5-6 hrs. with alc. KOH (0.1 g. per cc.) it solidifies to a cryst. mass sol. in much  $\text{H}_2\text{O}$  and yielding on acidification the *amidic acid*, fine woolly needles from dil. AcOH, m.  $222^\circ$  (foaming), sol. in warm soda and sepg. on cooling as the difficultly sol. Na salt. *Chloride*, from A and the calcd. amt. of  $\text{PCl}_5$  on the  $\text{H}_2\text{O}$  bath, prisms from  $\text{C}_6\text{H}_6$ -petr. ether, m.  $150^\circ$ , easily decompd. by hot  $\text{H}_2\text{O}$ , instantly sol. in alkali with regeneration of A, converted by holding in  $\text{C}_6\text{H}_6$  with 4 parts  $\text{PhNH}_2$  into the *dianilide*, m.  $285^\circ$ . When 2 g. A and 4 g. cinchonine in 90 cc. of 75% alc. are allowed to stand overnight the *neutral salt of the l-acid* seps. in needles, m.  $192^\circ$ , converted by short boiling with excess of  $\text{NH}_4\text{OH}$  into the free *l-acid*; the *d-acid* is similarly obtained from the salt in the mother liquors. Both acids m.  $223^\circ$  and when mixed show the m. p.,  $239^\circ$ , of the *dl-A*. The *l-acid* shows  $[\alpha]_D^{20}$   $78.37^\circ$  in 96% alc. ( $p$  2.66%), the *d-acid*  $65.42^\circ$  ( $p$  2.598%). In racemization expts. the *l-acid* proved to be very stable, its m. p. being unchanged by boiling 1.5 hrs. either with dil. NaOH or with concd. HCl but on fusion with alkali it readily went over into *dl- $\delta$ -truxinic acid*. *l-Anhydride*, m.  $162^\circ$ ,  $[\alpha]_D -145.84^\circ$  in  $\text{Me}_2\text{CO}$  ( $p$  1.946%); *chloride*, m.  $160^\circ$ ,  $[\alpha]_D -98.62^\circ$  in  $\text{C}_6\text{H}_6$ . *d-Methyl ester*, m.  $106^\circ$ ,  $[\alpha]_D$   $89.88^\circ$ . V. The seventh acid of the truxillic acid group, *neotruxinic acid*. R. STORRMER and E. LAAGE. *Ibid* 96-101.—The *neotruxinic acid* (A) occurs in such small amt. (about 0.12%) in the crude acids obtained in the manuf. of cocaine (see Paper III above) that an extensive investigation of the acid from this source was excluded but by good fortune S. and L. were able to prep. it artificially by the rearrangement of the  $\beta$ -acid by means of  $\text{C}_6\text{H}_5\text{N}$ ; the two acids (which apparently form an equil. mixt.) are difficult to sepg. because they have exactly the same m. p. and differ but slightly in their solubilities. That A is really a truxinic and not a truxillic acid is shown by the fact that it is formed from  $\beta$ -truxinic acid, that on heating its  $\text{NH}_4$  salt it regenerates the imide of the  $\beta$ -acid and that on KOH fusion it yields  $\delta$ -truxinic acid. The transformation into the imide of the  $\beta$ -acid indicates that it is a *trans-acid*. It is obtained in 3.5 g. yield from 6 g. of the  $\beta$ -acid, 12 g.  $\text{C}_6\text{H}_5\text{N}$  and 20 cc.  $\text{H}_2\text{O}$  heated 5 hrs. at  $160-70^\circ$ , dild. with 200 cc.  $\text{H}_2\text{O}$ , pptd. with HCl and boiled out twice with 200 cc. of 5% alc. (which leaves undissolved 1.2 g. of the  $\beta$ -acid); esterification with  $\text{Me}_2\text{SO}_4$  in soda gives 2.5 g. (1.1 g. pure) of the *methyl ester*, m.  $125^\circ$  after crystn. from dil. alc., which on sapon. with cold alc. KOH and crystn. of the product from  $\text{C}_6\text{H}_6$ -AcOH yields 0.65 g. of the pure acid. A better method of purification consists in satg. 4.1 g. of the crude acid in 100 cc. alc. with  $\text{NH}_3$ , extg. with 125 cc. hot 96% alc. and acidifying the undissolved  $\text{NH}_4$  salt (yield, 1.9 g.). A may also be obtained in 1.1-g. yield (after purification through the  $\text{NH}_4$  salt) by heating 5 g. of the  $\beta$ -acid with 30 g.  $\text{PhNMe}_2$  3 hrs. in an open dish at  $160-70^\circ$ . A m.  $209-9.5^\circ$  and, when mixed with the  $\beta$ -acid,  $185-90^\circ$ , is quant. pptd. from  $\text{NH}_4\text{OH}$  by  $\text{CaCl}_2$  after a short time, mol. wt. 286.6 in boiling alc., gives with KOH in alc. a cryst. *potassium salt*; *ammonium salt*, cryst. powder, m.  $235^\circ$  (decompn.), sol. in hot  $\text{H}_2\text{O}$  without hydrolysis, forms when tightly packed and heated to  $235-40^\circ$  the  $\beta$ -truxinic imide which can be obtained in the same way directly from the  $\text{NH}_4$  salt of the  $\beta$ -acid. The imide is insol. in cold soda but dissolves on boiling and on cooling deposits leaflets, apparently of the Na salt, sol. in much  $\text{H}_2\text{O}$ ; it dissolves in hot NaOH and on acidification after boiling some time the  $\beta$ -acid is pptd. If the imide (0.4 g.) is allowed to stand with 1 cc. of alc. KOH (0.1 g. KOH) it dissolves and after a time

deposits *potassium  $\beta$ -truxinamidate*; free acid, woolly felted druses, m. 193-4° (foaming), purified through the insol. *sodium salt*. *Neotruxinamide*, from A through the chloride in Et<sub>2</sub>O with NH<sub>4</sub>OH, scales from alc., m. 249°.  $\beta$ -Truxinyl chloride with concd. NH<sub>4</sub>OH gives after a time the *amide*, felted needles from alc., m. 239°; the NH<sub>4</sub>OH mother liquor on acidification yield a resinous acid consisting of at least two components, one of which is the *amidic acid*, m. 193-4°, isolated by conversion into the difficultly sol. Na salt with excess of hot soda. *Methyl ester* of A, needles from dil. MeOH, m. 126-7°. *Ethyl ester*, oil.

CHAS. A. ROUVILLER

The synthesis of inositolhexaphosphoric acid. S. POSTERNAK. *Helvetica Chim. Acta* 4, 150-65(1921); cf. C. A. 13, 2058, 2388.—P. presents a detailed description of his method, and criticizes the work of Anderson (C. A. 14, 2928) who attempted to repeat P.'s expts. To prep. the double Ca-Na salt of the natural phospho-organic principle, aq. exts. of seeds, grains, or potatoes are pptd. with an excess of Ca(AcO)<sub>2</sub>, the ppt. is filtered off, washed, dissolved in a slight excess of concd. HCl, and reprecip. by 2 vols. of EtOH. After several hrs. the ppt. is filtered off, washed with EtOH, and dried *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, giving an acid Ca salt, almost completely sol. in H<sub>2</sub>O. This is dissolved, after weighing, in 3 vols. of H<sub>2</sub>O (a slow process), and treated with 3 parts of CaH<sub>2</sub>O<sub>4</sub>+2H<sub>2</sub>O in soln. for each 14 parts of salt, followed by 3 parts of 10 N NaOH. After 2-3 hrs. the CaC<sub>2</sub>O<sub>4</sub> is filtered off, washed with a little H<sub>2</sub>O, so that the combined filtrate and washings do not exceed 15 times the wt. of the salt employed, then 9 parts of 10 N NaOH are added and the mixt. is shaken vigorously. A ppt. which forms at first redissolves, then sodium calcium inositolhexaphosphate, C<sub>6</sub>H<sub>8</sub>O<sub>4</sub>P<sub>6</sub>Ca<sub>2</sub>Na<sub>8</sub>, seps. as tufts of fine needles, which are washed with H<sub>2</sub>O and EtOH, and dried on a porous plate. The air-dried salt at low temp. contains 33H<sub>2</sub>O, while in summer it contains 23H<sub>2</sub>O, which is reduced by drying over H<sub>2</sub>SO<sub>4</sub> to 8H<sub>2</sub>O. Dried at 120°, the salt contains 3H<sub>2</sub>O, which cannot be driven off without decompn. The Na salt may be obtained from any mixt. of salts of the phospho-organic principle by dissolving them in dil. HCl and pptg. with excess of FeCl<sub>3</sub>, filtering off and washing the Fe salt, and decompg. with excess of NaOH when suspended in H<sub>2</sub>O. The filtrate, dild. with an equal vol. of EtOH, deposits a sirupy mass, which soon solidifies, after which the EtOH is decanted, the cryst. mass dissolved in 2 vols. of H<sub>2</sub>O, the remainder of the EtOH removed on the water bath, and the soln. cooled to 2-3°, at which temp. the satd. Na salt, C<sub>6</sub>H<sub>8</sub>O<sub>4</sub>P<sub>6</sub>Na<sub>10</sub>·3H<sub>2</sub>O + 44H<sub>2</sub>O, is deposited as a compact mass of prisms, efflorescent, m. in its crystal H<sub>2</sub>O below 46°. A second hydrate with 35H<sub>2</sub>O forms at about 20°, flat prisms, not efflorescent, difficultly sol. in cold H<sub>2</sub>O, easily sol. in H<sub>2</sub>O at 50°, insol. in EtOH, m. 58-9°; the aq. soln. can be titrated with Me orange, requiring 6 equivs. of acid. The salt loses 35 H<sub>2</sub>O after drying *in vacuo* over H<sub>2</sub>SO<sub>4</sub> followed by an air bath at 120°; at 180° an additional 1.5 H<sub>2</sub>O is lost; and 2.5 H<sub>2</sub>O at 210°, with profound decompn., about half of the total P being changed to Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub>. To synthesize inositolhexaphosphoric acid, 6 g. of anhydrous inositol are dissolved by heat in 28 g. of H<sub>3</sub>PO<sub>4</sub>, dried *in vacuo* at 100-110°, 45 g. of P<sub>2</sub>O<sub>5</sub> added in 10-g. portions at intervals of a few mins.; during this addition the mass should be broken up and well shaken. The reaction is completed by heating to 120° for 3 hrs., giving on cooling a semi-solid mass, which is dissolved in 500 cc. of 5N NaOH, boiled for 5 mins., and evapd. to 500 g. in a tared porcelain dish. The crystals are filtered and washed with 75 cc. of cold H<sub>2</sub>O, giving when moist about 200 g. of mineral phosphates. The mother liquor is evapd. to 175 g., the new crop of phosphates removed and washed, and the mother liquor mixed with 1 vol. of 85% EtOH and allowed to stand overnight. The supernatant alc. soln. is decanted, carrying with it the excess of NaOH, while the sirupy deposit is filtered with suction to remove fine crystals of Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub>, which are washed with a little 50% EtOH, dissolved in 10 cc. of H<sub>2</sub>O, pptd. with 85% EtOH, and after crystn. filtered off, the small quantity of sirup obtained being added to the main portion. This



treatment removes all but negligible traces of mineral phosphates. The sirup is then dissolved in 500 cc. of  $H_2O$ , acidified with 15 cc. of  $AcOH$ , and pptd. with 50 cc. of 20%  $Ca(AcO)_2$ . The ppt., filtered and washed with  $H_2O$ , is reserved as fraction I, while the filtrate is again pptd. with the same amt. of  $Ca(AcO)_2$ , giving fraction II. Finally the filtrate is heated to boiling and again pptd. yielding fraction III: Each of the fractions is then transformed into the Ca-Na salt as described above, but it is noted that on adding  $NaOH$  to the Ca salt, the ppt. does not dissolve completely, as with the natural product, and the insol. matter is filtered off. Fraction I gives at first globular masses which are filtered off after a few hrs., the characteristic tufts of the double salt then appearing. Fraction II crystals more rapidly. The yield in two expts. was 2.58 and 2.48 g. of dried Ca-Na salt, or about 8% of theory. Recovery of further product from the mother liquors has been unsuccessful. Transformation into the satd. Na salt is carried out as above. Elaborate crystallographic data establish the identity of the synthetic and natural products. The ppt. formed on adding  $NaOH$  to the Ca salt gave on pptg. its soln. in dil.  $HCl$  with  $Ca(AcO)_2$ , a white substance closely corresponding to pentacalcium inositolhexaphosphate in compn. but consisting of salts of  $H_2P_2O_7$  and of inositoltetraphosphoric acid, giving hexa- and octabasic salts, as shown by the Ca and Cu compds. Anderson's negative results were due to defective methods of removing the mineral salts from the reaction mixt., and especially to the use of  $H_2SO_4$ , which rapidly decomps. the org. P compd., forming  $H_3PO_4$ . Also in *J. Biol. Chem.* **46**, 453-7(1921).

M. R. SCHMIDT

**Constitution of the methylethylcyclohexanone prepared by ethylation of 1-methylcyclohexan-6-one.** A. HALLER AND R. CORNUBERT. *Compt. rend.* **170**, 973-6(1920).—The compd. previously prepd. by the ethylation of 1-methylcyclohexan-6-one in the presence of sodamide (cf. *C. A.* **7**, 3490) is shown to be 1-ethyl-1-methylcyclohexan-6-one. Like dimethylcyclohexanone (cf. *C. A.* **14**, 1965), it gives a benzylidene deriv., which is 5-benzylidene-1-methyl-1-ethylcyclohexan-6-one, m. 78-8.5°, and a compound,  $C_{22}H_{34}O_4$ , m. 148-50°. J. C. S.

**The preparation of limonene and pinene nitrosochloride.** H. RUPE. *Helvetica Chim. Acta* **4**, 149-50(1921).—This method is credited to K. Löffl (*Diss. Basle*, 1915): A suction flask, containing a thin paste of  $NaCl$  and concd.  $HCl$ , is provided with a 2-hole stopper carrying 2 dropping funnels, one of which contains concd.  $H_2SO_4$ , while the other contains concd.  $NaNO_2$  soln., which are introduced in about the ratio of 2 parts of the former to 3 parts of the latter, excess of  $HCl$  being avoided in the gas mixt. at all times. The gases are cooled and dried by  $CaCl_2$ , the drying towers being surrounded by ice, and led into a cylindrical vessel containing limonene or pinene in 1 vol. of  $Et_2O$  and 0.5 vol. of glacial  $AcOH$ , cooled by ice and salt. The soln. becomes light green at first, then bluish green; a brownish tone indicates excess of  $N$  oxides, while a dark green shows excess of  $HCl$ ; the latter is particularly to be avoided, as no solid nitrosochloride will be obtained in the presence of excess  $HCl$ . Yields are as high as 90%.

M. R. SCHMIDT

**Certain derivatives of thujamenthone.** MARCEL GONCHOT. *Compt. rend.* **172**, 686-8(1921).—G. (*C. A.* **8**, 3437) has shown that thujone (A) when subjected to the action of reduced  $Ni$  and  $H_2$  at 175-180° goes directly into thujamenthone (B) and this transformation renders available a source of material from which certain new derivs. can be obtained. 1,2-Dimethyl-3-isopropylcyclopentane (Taboury and G., *Bull. soc. chim.* [4] **13**, 601) results when B is treated with  $H_2$  at 280° using  $Ni$ .  $H_2O$  is formed at the same time owing to the replacement of the  $CO$  group by  $CH_2$ . When B is treated with  $MgMeI$  a mixt. of two 1,2,3-trimethyl-4-isopropylcyclopentenones is formed and when these compds. are hydrogenated, in the presence of  $Ni$ , 1,2,3-trimethyl-4-isopropylcyclopentane is formed, b. 157-8°, a liquid with an odor resembling that of the terpenes.

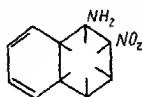
When it is subjected to the action of  $\text{CaH}_2$  following the method of Taboury and G. (C. A. 13, 3158) the action is very vigorous and no definite products could be isolated, but when B is treated with  $\text{CaH}_2$  a new bicyclic unsatd. ketone, *2,3-dimethyl-4-isopropyl-cyclopentylidene-2,3-dimethyl-4-isopropyl-1-cyclopentanone* is formed, a yellow liquid, with an odor resembling that of camphor, b.  $182-4^\circ$ . The oxime was difficult to purify and the semicarbazone could not be prepd. owing perhaps to steric hindrance.

H. E. WILLIAMS

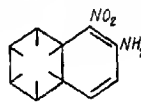
**Condensation of salicylaldehyde and thymol.** Synthesis of *o*-hydroxyphenyldithymylmethane. F. LAVILLA LAURENS. *Anal. fis. quim.* 18, 139-47 (1920).—The object of the investigation is to prep. triarylmethanes with a OH group on each  $\text{C}_6\text{H}_4$  nucleus, and to study their physicochem. properties. The first of these compds. to be prepd. is *o*-hydroxyphenyldithymylmethane,  $\text{OHC}_6\text{H}_4\text{CH}(\text{C}_6\text{H}_3\text{MePr}^2\text{OH})_2$ , colorless, oblique prisms containing  $1\frac{1}{2}\text{H}_2\text{O}$ , m.  $185^\circ$ , from salicylaldehyde and thymol in presence of a small quantity of  $\text{H}_2\text{SO}_4$ . The *triacetyl* and *tribenzoyl* derivatives and the *triethyl* and *triethyl* ethers are described; the last 3 compds. m.  $126-7^\circ$ ,  $137-8^\circ$ , and  $77-8^\circ$  resp. A *tribromo* derivative,  $\text{C}_{27}\text{H}_{18}\text{O}_2\text{Br}_3$ , m.  $170^\circ$ , is obtained in  $\text{AcOH}$ . The corresponding *tri-iodo* compound m.  $111^\circ$ . The *trisodium* salt,  $\text{C}_{27}\text{H}_{18}\text{O}_2\text{Na}_3$ , crystals, is decompd. slightly by  $\text{CO}_2$ . Amorphous ppts. are obtained: with Ph salts, light yellow; Cu salts, bluish green; and ferric salts, yellowish brown.

J. C. S.

**Action of *o*-chlorobenzaldehyde on weakly basic amines, especially those of the naphthalene series.** (Also a contribution to the constitution of naphthalene derivatives.) FRITZ MAYER AND AUGUST BANS. *Ber.* 54B, 18-24 (1921); cf. C. A. 14, 1538.—It had been found that in the case of weakly basic amines reacting with *o*- $\text{ClC}_6\text{H}_4\text{CHO}$  (A) the azomethine formation,  $\text{RNH}_2 + \text{A} = \text{RN}=\text{CHC}_6\text{H}_4\text{Cl} + \text{H}_2\text{O}$ , is repressed in favor of the iminoaldehyde formation,  $\text{RNH}_2 + \text{A} = \text{RNHC}_6\text{H}_4\text{CHO} + \text{HCl}$ , but from 1,4- and 2,1- $\text{C}_{10}\text{H}_7(\text{NH}_2)\text{NO}_2$  in the presence of Cu powder and soda in boiling  $\text{PhNO}_2$  only the azomethines were obtained. An extensive study of the nitronaphthylamines has now been made. 1,2- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{NO}_2$  forms no azomethine but apparently a small amt. of the iminoaldehyde; 1,5- and 1,8- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{NO}_2$  give only the azomethines; 1,2,4- $\text{C}_{10}\text{H}_3(\text{NH}_2)(\text{NO}_2)_2$  yields neither the azomethine nor the iminoaldehyde; but 2,5- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{NO}_2$  smoothly forms the azomethine. Comparison of the basicities of the 2,1- and 1,2- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{NO}_2$  shows that the HCl salt of the former is far more stable than that of the latter and the cond. of the former base is of the order of magnitude of  $2 \times 10^{-6}$  while that of the latter is too small to be measurable. A possible explanation of the differing behavior of the 2 compds. toward A may be found in the Harries-Willstätter formula for  $\text{C}_{10}\text{H}_8$ , one of the bases (I) being an aromatic amine with an additional olefinic nucleus, in which the slight basicity is easily explainable by the disturbance produced by the *o*- $\text{NO}_2$  group in the aromatic nucleus. The other base (II), on the other hand, has the  $\text{NH}_2$  group in the olefinic part of the mol. and the basicity is stronger, the  $\text{NO}_2$  group not being able to make its disturbing influence felt so strongly. To det. whether an azomethine was formed the components, often moistened with a little alc., were heated 0.5 hr. on the  $\text{H}_2\text{O}$  bath (hereafter designated as w. b. expt.). The iminoaldehyde condensation was effected by heating the amine and an excess of freshly distd. A with  $\text{PhNO}_2$  or  $\text{C}_{10}\text{H}_8$ , the calcd. amt. of anhydrous soda and some Cu powder at  $220^\circ$  for a shorter or longer period of time, depending on the amt. of  $\text{H}_2\text{O}$  formed ( $\text{PhNO}_2$  and  $\text{C}_{10}\text{H}_8$  expts.). 1,2- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{NO}_2$  was unchanged in the w. b. expt.; in a  $\text{C}_{10}\text{H}_8$  expt. (2.8 g. A, 3.8 g. amine, 1.06 g. soda,



I



II

0.25 g. Cu powder and 30 g.  $C_{10}H_8$  heated 45 min.), the melt was taken up in  $C_6H_6$ , filtered, freed from  $C_6H_6$  and  $C_{10}H_8$  with steam and from unchanged starting material with hoiling  $H_2O$ , leaving a black substance which could not be crystd. and was heated 0.5 hr. on the  $H_2O$  bath with concd.  $H_2SO_4$ ; a green fluorescence was produced and  $H_2O$  gave an olive-green ppt. which, treated with  $NH_4OH$  and filtered, yielded a tarry green-black mass, from which no cryst. HCl salt could be obtained. Apparently the iminoaldehyde is formed in small amt. and under the influence of the concd.  $H_2SO_4$  loses its  $NO_2$  group and condenses to the corresponding naphthacridine. *5-Nitro-1-[2,2'-chlorobenzylideneamino]naphthalene*, from 1,5- $C_{10}H_8(NH_2)NO_2$  by the w. b. or  $C_{10}H_8$  methods, crystals from  $C_6H_6$ , m.  $180^\circ$ . *8-Nitro isomer*, from 1,8- $C_{10}H_8(NH_2)NO_2$  by the w. b. method, dark yellow rhombic prisms from  $C_6H_6$  containing A, m.  $122^\circ$ ; a  $C_{10}H_8$  expt. gave no product producing fluorescence with  $H_2SO_4$ . 1,2,4- $C_{10}H_8(NH_2)(NO_2)_2$  is unchanged in the w. b. and  $C_{10}H_8$  expts. *5-Nitro-2-[2'-chlorobenzylideneamino]naphthalene*, from 2,5- $C_{10}H_8(NH_2)NO_2$  by the w. h. and  $C_{10}H_8$  methods, greenish yellow hair-like crystals from  $C_6H_6$ , m.  $164^\circ$ . From 3 g.  $o-H_2NC_6H_4CHO$ , 7.5 g. A,  $\alpha-C_{10}H_7Br$ , 1.5 g. soda, 0.25 g. Cu powder and 30 g.  $C_{10}H_8$  heated 45 min. and worked up as described above and treated with  $H_2SO_4$  is obtained naphthacridine sulfate. 2,6-( $O_2N$ ) $_2$ - $C_6H_3NH_2$  is unchanged by the w. b. method and in the  $C_{10}H_8$  expt. gives only a small amt. of a brown amorphous substance, m. around  $203^\circ$ , extd. from the reaction product, after steam distn., with  $C_6H_6$ . *2-Hydroxy-1-[2'-chlorobenzylideneamino]benzene*, from  $o-H_2NC_6H_4OH$  by the w. b. or  $C_{10}H_8$  methods, needles from  $C_6H_6$ , m.  $93^\circ$ , shows green fluorescence in  $C_6H_6$ . 2,4-( $O_2N$ ) $_2$ - $C_6H_3NH_2$  is unchanged in the w. b. expt. with  $m-ClC_6H_4CHO$ ; in a  $PhNO_2$  expt. (4 hrs. heating) was obtained a small amt. of a yellow substance, m.  $129^\circ$ , which was apparently *m-[2,4-dinitrophenylamino]benzaldehyde* still somewhat impure (found, C 52.77-52.93, H 3.19-3.22, N 15.5-15.58%). *p-Cl-C\_6H\_4CHO* does not react with 2,4-( $O_2N$ ) $_2$ - $C_6H_3NH_2$  either in the  $H_2O$  bath or  $C_{10}H_8$  methods. *o,o'-[1,5-Antraquinonyldiimino]dibenzaldehyde*, from 1,5-diaminoanthraquinone by the  $PhNO_2$  method (45 min. heating) in small yield, violet substance sol. in concd.  $H_2SO_4$  with yellow color turning to brown on heating. C. A. R.

$\Delta^1$ -Dihydronaphthalene. III. Methods of formation of  $\Delta^1$ -dihydronaphthalene. FRITZ STRAUSS AND LEO LEMMEL. Univ. Strassburg i/Els. Ber. 54B, 25-40(1921); cf. C. A. 7, 2554; Willstätter and King, C. A. 7, 1508.—It was shown in the earlier papers that  $\Delta^1$ -dihydronaphthalene (A) is formed by rearrangement of the  $\Delta^2$ -compd. (B) by long heating with 5% ethylate soln. at  $140^\circ$ , i. e., under conditions adapted for the further reduction of B to tetrahydronaphthalene (C) in AmOH. Almost simultaneously W. and K. obtained A from  $C_{10}H_8$  with Na and EtOH but thought it was B and assumed that the discordant properties of their prepn. were due to insufficient purification. To explain these contradictions it was necessary to devise a method of identifying A and B in mixts. with each other and with  $C_{10}H_8$  and C and of detg. them approx. quant. Such a method was found in the action of  $Hg(OAc)_2$ , which does not attack  $C_{10}H_8$  or C, converts B into Sand and Genssler's addition product (Ber. 36, 3705(1903)) and with A is reduced to  $HgOAc$ , yielding a mixt. of stereoisomeric 1,2-dihydroxytetrahydronaphthalenes (see following abstr.). This difference in behavior of A and B towards  $Hg(OAc)_2$  corresponds exactly to that of the allyl- and propenyl-benzenes and thus affords a further purely chem. parallelism between the two types of compds. in addition to that which had already been observed in their conduct on reduction, and furthermore confirms the conclusions previously drawn as to the role of A in the hydrogenation of  $C_{10}H_8$ . Again, the optical consts. of A and B (v. Auwers, C. A. 8, 119) show the same influence of the conjugation of the double bonds as was to be expected from the values for the corresponding  $C_6H_5$  derivs. and the same is true of the heats of combustion (C. A. 9, 995). Bamberger's rule that in the 4-fold hydrogenation of  $C_{10}H_8$  the products behave like  $C_6H_5$  derivs. with aliphatic side chains is

thus established experimentally for the dihydro derivs., even to the fine differences arising from the position of the double bond in the non-hydrogenated nucleus. In this connection may again be pointed out the close relationship between the degree of satn. of the second ring and the odor of the compds., a relationship in which even the conjugation has a distinct influence; the odor increases in intensity in the order C, B,  $C_{10}H_8$  and A; pure C, contrary to the earlier statements, has only a very faint,  $C_{10}H_8$ -like odor. The rearrangement of B into A takes place much more easily than was thought previously, but to obtain marked rearrangement of an equal velocity of reaction each concn. of ethylate soln. requires a certain sufficiently high temp. The further reduction of the dihydronaphthalenes to C was effected in alc. with Pd and H rather than with Pt in AcOH; the former method has the advantage that the absorption stops with 1 mol.  $H_2$ . Dihydronaphthalenes can be obtained not only by addition of H to  $C_{10}H_8$  but by cleavage reactions from monosubstituted tetrahydronaphthalenes:  $C_{10}H_7X \rightarrow HX + C_{10}H_8$  ( $X = Cl, OH, NH_2, HNO_2, NMe_2OH$ ); thus far, it had always been thought that the product was B. S. and L. have repeated these reactions and find that it is A that is really formed; the former erroneous conclusions were due to the similarity in m. ps. of the dibromides of A and B. This reaction again has its parallel in the chemistry of the propylbenzenes. Finally it has been confirmed experimentally that A is the mother substance of v. Baeyer and Schoder's  $\Delta^1$ -dihydronaphthoic acid (*Ann.* 266, 176(1891)). A can be prepd. directly (without isolating B) by reducing 45 g.  $C_{10}H_7$  with 68 g. Na and 900 cc. alc. according to Bamberger (*Ann.* 288, 75(1893)), then slowly distg. off 300–50 cc. alc.; the NaOEt thus reaches a concn. of 10–20% at which the rearrangement of B into C takes place and is ended when at a bath temp. of 112–5° the NaOEt begins to cryst. out. From this point B's procedure is again followed out. The alc. first passing over on steam distn. contains 10–2 g. hydrocarbon and must be separately worked up; it was distd. through a fractionating column down to 100 cc. and the distillate was again similarly concd. to 100 cc.; the two concd. distillates were pptd. with  $H_2O$  and the pptd. hydrocarbons taken up in a little  $Et_2O$  and combined with the main portion; the  $Et_2O$  soln. is carefully freed from alc. by repeated shaking with  $H_2O$ . There is thus obtained 43 g., b<sub>p</sub> 86°, containing about 90% A, mixed with small amts. of  $C_{10}H_8$  and C but free from B. Once such a crude product deposited leaves, m. 48–54°, clear 56°, apparently mixed crystals of  $C_{10}H_8$  with 24% A; 0.464 g. required 14 cc. of 1% Br in  $CHCl_3$  and the somewhat tarry product was sepd. by beating *in vacuo* at 80° into  $C_{10}H_8$  and the dibromide of A, m. 67.5–8.0° after crystn. B's observation that on reduction of  $C_{10}H_7$  with 96% instead of abs. alc. there is obtained a mixt., m. about 40°, of  $C_{10}H_8$  and B, was confirmed; S. and L.'s product m. 34–7°, clear 41.5° after distn. *in vacuo* and contained about 60% B. The crude A (36 g.) in 200 cc.  $CS_2$  is treated in the cold with 15% Br in  $CS_2$  until the Br color persists, freed from the solvent *in vacuo* and from oily impurities with petr. ether; yield of dibromide, 47 g. This after one crystn. from petr. ether (b. 40–60°) is perfectly pure and yields pure A. *ac*-Tetrahydro- $\beta$ -naphthol heated 15 min. at 200° with 10 g. KOH gave 6 g. pure A; small amts. of A are already formed in the prepn. of the tetrahydronaphthol (starting with 50 g.  $\beta$ -naphthol, 2.4 g. A were isolated). The crude  $\beta$ -chlorotetrahydronaphthalene obtained from 8.3 g. of the naphthol, heated 20 min. at 190–200° in dry air, yielded 2.4 g. not quite pure A. From 3.5 g. *ac*-tetrahydro- $\beta$ -naphthylamine nitrite decompd. under a reflux at 150° were obtained 0.5 g. of an oily product yielding a partially oily dibromide, the solid portions of which proved to be the dibromide of A. *ac*-Tetrahydro- $\beta$ -naphthylamine (1.5 g.) and 1.5 cc.  $AmNO_2$  heated over a free flame until there was a vigorous evolution of N gave 1 g. almost pure A. The K salt from 12 g.  $\Delta^1$ -dihydronaphthoic acid, mixed with quicklime and distd. in a current of moist H, the distillate being taken up in  $Et_2O$  and fractionated *in vacuo*, gave 5.5 g. b. up to 105° and 0.8 g. of a yellow viscous residue; the distillate contained  $C_{10}H_8$ .

(probably produced from  $\alpha$ -C<sub>10</sub>H<sub>7</sub>CO<sub>2</sub>H present in the dihydro acid) and 71% of A; the residue crystd. from alc. in yellow leaflets with blue fluorescence, m. 97.5–100°, having the same empirical compn. as A and a mol. wt. of 263.5 in boiling Et<sub>2</sub>O; it therefore seems to be a dimer of A. To det. the course of the rearrangement of B into A 5 g. of B was heated with the NaOEt in open vessels or in sealed tubes, treated with H<sub>2</sub>O, acidified, taken up in Et<sub>2</sub>O, carefully freed of alc. by washing with H<sub>2</sub>O, concd. to about 100 cc., shaken 24 hrs. with Hg(OAc)<sub>2</sub> (15 g. in 100 cc. H<sub>2</sub>O), filtered, washed with Et<sub>2</sub>O, dried, weighed and extd. in a Soxhlet with 100 cc. of thiophene-free C<sub>6</sub>H<sub>6</sub>. The addition product of B which crystallizes out from the C<sub>6</sub>H<sub>6</sub> and the HgOAc remaining undissolved in the thimble give an indication as to how far the rearrangement has gone, but although the formation of the addition product of B is complete after 24 hrs., shaking this may not be true as regards the oxidation of the A and some unchanged A may remain dissolved in the Et<sub>2</sub>O, which must be shaken longer with Hg(OAc)<sub>2</sub> (36 hrs.), or the unchanged A may more conveniently be detd. by titration with Br; the Et<sub>2</sub>O soln. is neutralized with NaOH, dried over Na<sub>2</sub>SO<sub>4</sub>, evapd. to dryness *in vacuo*, extd. with low boiling petr. ether and the crude A titrated with Br; the glycol resulting from the oxidation of the A (see following abstr.) remains undissolved. It was found that while 60 min. heating at 87° with 30 cc. of 5% NaOEt or 65 min. at 130–40° with 10 drops NEt<sub>3</sub> gave practically no A, yields of 77, 82 and 81%, resp., were obtained by heating 30 min. at 130–40° with 15 cc. of 5% NaOEt, 60 min. at 100–5° with 30 cc. of 10% NaOEt and 60 min. at 100–5° with 30 cc. of 5% NaOEt. IV. Conversion of  $\Delta^1$ -dihydronaphthalene into alicyclic substitution products of tetrahydronaphthalene. FRITZ STRAUSS AND AUGUST ROHRBADHER. Univ. Strassburg i. Els. and Handelshochschule Berlin. *Ibid* 40–69.—From 15 g.  $\Delta^1$ -dihydronaphthalene dibromide (A) heated under a reflux, first at 130° under 13 mm., then at 175° under 50 mm. (3 hrs. in all), is obtained 1-bromo- $\Delta^1$ -dihydronaphthalene, b<sub>17</sub> 144–6°, darkens on standing, instantly decolorizes alk. KMnO<sub>4</sub>, absorbs Br in CS<sub>2</sub> only on long standing and apparently only with formation of HBr. The first fractions of the reaction product (up to 130°) contain C<sub>10</sub>H<sub>8</sub> and 40% of  $\Delta^1$ -C<sub>10</sub>H<sub>10</sub> (B), so that besides the splitting off of 2 mols. of HBr there is also to a small extent a dissociation into Br and B. When 10 g. A is boiled 3 hrs. in 50 cc. MeOH with 5 g. MgCO<sub>3</sub>, poured into acidified H<sub>2</sub>O, taken up in Et<sub>2</sub>O and freed from alc. with H<sub>2</sub>O there is obtained 7.5 g. 1-methoxy-2-bromotetrahydronaphthalene, b<sub>13</sub> 154–6°, has a very faint ester odor, gradually turns yellow, then brown on standing; it is also the main product when A is boiled 1 hr. with 2.5 mols. of 1% NaOMe but at the same time there are formed C<sub>10</sub>H<sub>8</sub> and apparently some bromodihydronaphthalene. 1-Hydroxy-2-chlorotetrahydronaphthalene (1.5 g. from 3.5 g. bleaching powder (80% available Cl) digested 24 hrs. in the dark with 100 cc. ice H<sub>2</sub>O, then treated with 3 g. powdered H<sub>3</sub>BO<sub>3</sub>, filtered after 0.5 hr., shaken 2 hrs. with 4 g. B, drained sharply, washed with low-boiling petr. ether and freed of inorg. salts by rubbing with dil. HNO<sub>3</sub>), long, stout, very brittle needles from 50% alc., m. 92°. 2-Bromo analog (C), from A in 10 parts Me<sub>2</sub>CO and as much H<sub>2</sub>O as can be added without producing a turbidity turbinéd with 0.5 part powdered MgCO<sub>3</sub> 7–8 hrs. at 50–5°, filtered, freed from most of the Me<sub>2</sub>CO by distn. and pptd. with H<sub>2</sub>O (yield, almost quant.), long needles from C<sub>6</sub>H<sub>6</sub>-petr. ether (3:2), m. 111–2°, converted quant. into A by allowing to stand several hrs. in C<sub>4</sub>H<sub>8</sub> satd. with dry HBr over fused CaBr<sub>2</sub>, regenerates B when boiled 3 hrs. in alc. with 3 parts coppered Zn dust, also when reduced 1 day in Et<sub>2</sub>O with excess of amalgamated Al. C (18 g.) in 600 cc. Et<sub>2</sub>O treated with 30 g. Na wire which was consumed in the course of 30 hrs. by the gradual addition of moist Et<sub>2</sub>O gave 4 g. B and 5.5 g. tetrahydro- $\beta$ -naphthol, b<sub>12</sub> 139–40°, whose phenylurethan, pearly leaflets from petr. ether, m. 98–9°, when heated 3 hrs. at 185–200° under a reflux in N decomps. into CO<sub>2</sub> and B. When finely powdered C (10 g.) is vigorously turbinéd with 13.5 g. Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, 17 g. concd. H<sub>2</sub>SO<sub>4</sub> and 65 cc. H<sub>2</sub>O, the temp.

being raised in the course of 2 hrs. to 50–55°, kept const. 2 hrs. and again raised during the next 2 hrs. to 65–70°, and the brown oily product is taken up in Et<sub>2</sub>O, repeatedly shaken with soda and dried over Na<sub>2</sub>SO<sub>4</sub>; there is obtained 9.5 g. *1-keto-2-bromotetrahydronaphthalene* (D), *b<sub>D</sub>* 140–2°, faintly yellow, has a very characteristic and extremely penetrating odor, strongly attacks the mucous membranes, produces painful inflammations on the skin, can be boiled a long time with H<sub>2</sub>O without developing an acid reaction but is very quickly attacked by alkalies and altered in various ways, depending on the conditions, also by amine bases. *Oxime*, needles from C<sub>6</sub>H<sub>5</sub>-petr. ether, *m.* 136.5–7.0°. Boiled 4 hrs. in 100 cc. alc. with 25 g. coppered Zn dust, 10.5 g. D gives 6 g. *1-ketotetrahydronaphthalene* (E), *b<sub>E</sub>* 132–3°, has a somewhat penetrating, almost peppermint-like odor, does not combine with NaHSO<sub>3</sub>; with its own wt. of Na in boiling alc. it gives 70% of *tetrahydro-α-naphthol*, oil of peculiar odor, *b<sub>E</sub>* 132–4°; *phenylurethan*, short needles from petr. ether, *m.* 121–2°, decomps. under the same conditions as the β-isomer into CO<sub>2</sub>, PhNH<sub>2</sub> and B. Δ<sup>1</sup>-*Dihydronaphthalene oxide*, obtained quant. from 15 g. C in 200 cc. cold alc. treated dropwise with 1 mol. of 10% KOH in MeOH, *b<sub>E</sub>* 124–5° but sometimes polymerizes to an undistillable mass solidifying in the cold to a glassy resin, *b<sub>E</sub>* 76–8°, *b<sub>E</sub>* 86–8°, solidifies to quadratic tables, *m.* 20–1°, has a pronounced C<sub>10</sub>H<sub>8</sub>-like odor, is easily volatile with steam, produces soezing, is apparently stable at room temp. The *polymerization product* is obtained by pouring an AcOEt soln. into an excess of alc. in amorphous flocks *m.* about 136–7° (decompn.). Heated 2 hrs. on the H<sub>2</sub>O bath with AcOH-HBr, the oxide regenerates C; with Na in moist Et<sub>2</sub>O it gives tetrahydro-β-naphthol (this explains why this alc. is formed in the reduction of C); heated 1.5 hrs. on the H<sub>2</sub>O bath with 1.5 g. piperidine 1.8 g. of the oxide gives 2.9 g. *1-hydroxy-2-piperidinotetrahydronaphthalene* (F below). When 10 g. of the oxide in 60 cc. petr. ether is satd. with HCl below 30°, treated with Et<sub>2</sub>O until everything dissolves, washed well with H<sub>2</sub>O, dried with Na<sub>2</sub>SO<sub>4</sub> and evapd., there remains a very viscous, faintly yellowish oil, 60–70% of which (crude β-ketotetrahydronaphthalene) *b<sub>E</sub>* about 137°; the residue (20–5%) solidifies to a brown glass. During the distn. a little H<sub>2</sub>O is split off and on opening the app. the odor of C<sub>10</sub>H<sub>8</sub> and HCl is perceptible. The crude ketone in Et<sub>2</sub>O-MeOH poured into a large excess of 40% NaHSO<sub>3</sub> gives 8–9.5 g. of the addition compd. The portion of the crude product which does not combine with NaHSO<sub>3</sub>, when extd. from the mother liquors with Et<sub>2</sub>O, yields a mobile halogenated oil having a sharp odor similar to that of the halogenstyrenes and *b<sub>E</sub>* 83–130°; apparently a part of the oxide is converted by the HCl into the chlorohydrin, which decomps. on distn. The glassy residue remaining after distg. the crude ketone gives on rubbing with a little AcOEt a cryst. portion sepd. into a difficultly sol. halogen-free substance, *m.* 243–5°, more easily sol. halogen-free felted needles (from alc.), *m.* 155.5–6.0°, and a halogenated substance *m.* about 109–10°. The pure ketone, obtained from the NaHSO<sub>3</sub> compd. by short warming with dil. H<sub>2</sub>SO<sub>4</sub>, and its oxime and phenylhydrazones agree in their properties with Bamberger and Lodter's products. The ketone is not very stable and soon becomes orange-yellow from the surface; protected from the air and light it can be kept some days. When aq. NaOH is run under an Et<sub>2</sub>O soln. and, after addition of a few drops of alc., it is shaken with air, there is imparted to the NaOH a characteristic, unstable, indigo-blue color; the oxide does not give this reaction. The ketone can be obtained directly (1.8 g. of the NaHSO<sub>3</sub> compd.) from C by boiling 7 g. C and 5 g. dry C<sub>6</sub>H<sub>5</sub>N under a reflux about 10 min.; at the same time there is formed 2.6 g. E which does not combine with the NaHSO<sub>3</sub>. *1-Hydroxy-2-piperidinotetrahydronaphthalene* (F), obtained almost quant. from equal parts of C and piperidine allowed to stand 24 hrs. at room temp. and heated 2–3 hrs. on the H<sub>2</sub>O bath, soft needles from petr. ether, *m.* 73–4°; *hydrochloride*, columns from EtOH-Et<sub>2</sub>O, *m.* 182–3°; *chloroaurate*, yellow needles from H<sub>2</sub>O, *m.* 167–8° (decompn.); *chloroplatinate*, *m.* 186–8° (decompn.); *picrate*, long yellow columns from dil. MeOH, *m.* 147.5–8.5°. *1-Benzoyloxy-2-piper-*

*idinoetrahydronaphthalene hydrochloride*, from **F** and about 2 mols.  $\text{BzCl}$  allowed to stand 24 hrs. at room temp. and then heated 3 hrs. on the  $\text{H}_2\text{O}$  bath, needles from  $\text{MeOH-Et}_2\text{O}$ , m.  $176.5-7.5^\circ$ ; free base, columns from  $\text{MeOH}$ , m.  $81^\circ$ . *1-Hydroxy-2-diethylaminotetrahydronaphthalene*, from 15 g. **C** and 12 g. anhydrous  $\text{NHEt}_3$  allowed to stand 48 hrs. and then boiled 2-3 hrs. under a reflux, somewhat viscous oil,  $b_{117}$   $166-7^\circ$ . *2-Dimethylamino homolog* (3.5 g. from 10 g. **C** heated 7 hrs. at  $80^\circ$  in a sealed tube with 11 g. of 50%  $\text{NHMe}_3$ ),  $b_{120}$   $170-1^\circ$ ; *hydrochloride*, prismatic needles from  $\text{EtOH-Et}_2\text{O}$ , m.  $173-5^\circ$ . *2-Methylamino compound*, obtained quant. from 6.8 g. **C** and the  $\text{MeNH}_2$  from 8.5 g.  $\text{MeNH}_2\cdot\text{HCl}$  heated 6 hrs. at  $60-5^\circ$ , viscous oil,  $b_{117}$   $164-6^\circ$ ; *hydrochloride*, columns from  $\text{MeOH-Et}_2\text{O}$ , m.  $183-4^\circ$ . The two stereoisomeric *1,2-dihydroxytetrahydronaphthalenes* can be prepd. by almost exactly the same process used by Leroux for the 2,3-compds. (*C. A.* 5, 681) but S. and R. believe that the high melting form obtained from the bromohydrin is the *cis-trans*, that obtained from the bromide by double decompn. with acetates the *cis-cis* form. *cis-trans-Form* (4 g. from 10 g. **C** boiled 4 hrs. under a reflux with 4 g.  $\text{KOH}$  in 250 cc.  $\text{H}_2\text{O}$ ), long soft needles from  $\text{C}_6\text{H}_6$ , m.  $112-3^\circ$ ; *diacetate*, thick table-like crystals from petr. ether, m.  $84^\circ$ , regenerates the glycol almost quant. on sapon. The glycol (3 g.) in 5 cc. alc. and 300 cc.  $\text{H}_2\text{O}$  treated with 170 cc. of 5%  $\text{KMnO}_4$  at  $6^\circ$  gives 1.6 g.  $\alpha\text{-HO}_2\text{CC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$ . To prep. the *cis-cis-glycol*, 20 g. **A** is boiled 6 hrs. under a reflux with 60 g.  $\text{KOAc}$  and 100 g.  $\text{AcOH}$  poured into  $\text{H}_2\text{O}$ , extd. with  $\text{Et}_2\text{O}$ , freed from acid with soda, dried with  $\text{K}_2\text{CO}_3$  and the mixt. of acetates (12 g.  $b_{14}$   $183-5^\circ$ ) is boiled 1.5 hrs. with  $\text{KOH}$  in  $\text{MeOH}$ , neutralized with  $\text{CO}_2$ , filtered, evapd. to dryness, rubbed with  $\text{H}_2\text{O}$ , extd. with  $\text{Et}_2\text{O}$  and shaken with  $\text{NaOH}$  to remove a brown tar; repeated crystn. of the product (3.7 g.) from much  $\text{C}_6\text{H}_6$  finally gives 2 g. of a product m. const.  $90-1.5^\circ$ , which, however, is not homogeneous; when it is again acetylated and the product is crystd. from petr. ether it seps. in 2 forms, which can easily be sepd. mechanically into smaller pointed prisms of the *cis-trans*-acetate and larger stout prisms of the *cis-cis*-acetate, m.  $78.6-9.2^\circ$ , yielding with 15%  $\text{KOH}$  in  $\text{MeOH}$  the pure *cis-cis-glycol*, leaflets from  $\text{C}_6\text{H}_6$ , m.  $101.5-2.0^\circ$ . A similar mixt. of acetates (except that the *cis-cis*-form predominates) is obtained from 14 g. **A** boiled with 20 g.  $\text{AgOAc}$  and 100 cc.  $\text{AcOH}$ . In the way described above the product of the action of  $\text{Hg}(\text{OAc})_2$  on **B** (see preceding abstr.) was shown to be a mixt. of the two glycols. From 6.5 g. **B** in 350 cc. alc. treated in the course of 1.5 hrs. at  $-10^\circ$  to  $-5^\circ$  with 125 cc. of 4.1%  $\text{KMnO}_4$  containing 5%  $\text{MgSO}_4$  is obtained 2 g. of the glycol m.  $100-1^\circ$  and not a trace of its isomer. As hydroxylation with  $\text{KMnO}_4$  is, together with addition of  $\text{H}$ , the only addition reaction of unsatd. hydrocarbons which, so far as is known, is stereochemically homogeneous and leads to *cis-cis*-derivs., S. and R. believe this is stronger evidence in favor of the *cis-cis* structure of the glycol obtained by double decompn. with acetates than that advanced by Leroux (rupture of the oxide ring) in favor of the *cis-cis* structure for the glycols obtained from the bromohydrins.

CHAS. A. ROUILLER

**The anilides of  $\beta$ -hydroxynaphthoic acid.** E. R. BRUNSKILL. *J. Ind. Eng. Chem.* 13, 309 (1921).— $\beta$ -Hydroxynaphthoic acid (**A**) and its anilide (**B**), *p*-toluidide (**C**) and *p*-chloroanilide were used for dyeing cotton by adding to the cloth which had been soaked in a 2% soln. of the anilide in the theoretical amt. of  $\text{NaOH}$ , a satd.  $\text{NaCl}$  soln., and then adding a diazotized soln. of  $\text{PhNH}_2$ ,  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ ,  $5,2\text{-Cl}(\text{H}_3\text{N})\text{C}_6\text{H}_3\text{SO}_3\text{H}$ , *p*-toluidine,  $3,4\text{-O}_2\text{N}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{Me}$  or *o*-chloro-*p*-toluidinesulfonic acid. The anilides dissolved with a yellow color and without decompn. in warm dil.  $\text{NaOH}$ . All the colors made from **A** were not fast to rubbing and washing, especially those of the sulfonated amines. The anilides gave brighter colors than **A** and they were fairly fast except in the case of the sulfonated amines. By soaking in a 3%  $\text{CaCl}_2$  soln. for 30 min. at  $50^\circ$  all the colors were made faster. **C** and **D** gave brighter shades than **B**, and **D** gave brighter shades than **C** except when there was a  $\text{NO}_2$  group in the diazotized amine.

in which case C gave the brightest shades. The brightest shades were obtained when a NO<sub>2</sub> group was balanced with a Me group.

G. W. STRATTON

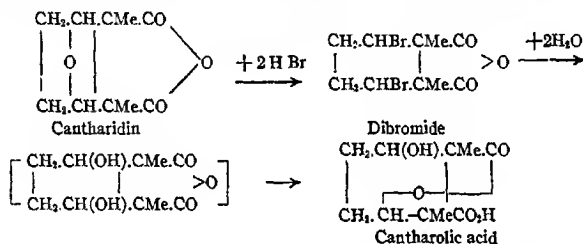
**Picrotoxin. IX. Degradation of picrotoxin by ozone.** P. HORMANN AND H. PRILLWITZ. *Arch. Pharm.* 258, 200-26 (1920); *J. Chem. Soc.* 118, I, 861-3.—Further insight into the constitution of picrotoxin (cf. *C. A.* 10, 2694, 2695) is afforded by the conversion of picrotoxinin by O<sub>3</sub> into HCO<sub>2</sub>H and a ketone,  $\alpha$ -picrotoxininone, which under the action of dil. H<sub>2</sub>SO<sub>4</sub> or concd. HCl, suffers a change similar to that of picrotoxin, and yields picrotoxinonic acid. These facts, combined with the behavior of the substance towards HNO<sub>3</sub>, lead the authors to the conclusion that the CH<sub>3</sub> group in picrotoxin is directly united to a ring C atom, CH<sub>3</sub>:CR(C<sub>10</sub>H<sub>14</sub>O<sub>4</sub>). Picrotoxinin is obtained in good yield from picrotoxin by a modification of the method described previously (cf. Meyer and Bruger, *Ber.* 31, 2958; Hormann, *C. A.* 6, 2923), and is converted by O<sub>3</sub> in AcOEt into the corresponding ozonide. Fission of the latter to HCO<sub>2</sub>H and  $\alpha$ -picrotoxininone, C<sub>10</sub>H<sub>14</sub>O<sub>7</sub>, is most conveniently effected by violent agitation with cold H<sub>2</sub>O. When rapidly crystd. from hot H<sub>2</sub>O, the substance seps. in shining needles (+H<sub>2</sub>O), and does not exhibit a sharp m. or decompn. p. either in the hydrated or anhydrous condition. It has  $[\alpha]_D^{17.5} -10^{\circ} 8.6'$  in alc. It behaves as a dilactone with 2 free HO groups. The presence of the ketonic O atom is shown by the isolation of a *semicarbazone*, leaflets (+H<sub>2</sub>O), which, when air-dried, begins to decomp. 230°, when anhydrous 224°, but without exhibiting a definite end-point of decompn., and a *phenylhydrazone*, silky needles decomp. 232-48° after discoloring at 225°. In boiling H<sub>2</sub>O  $\alpha$ -picrotoxininone is slowly transformed into  $\beta$ -picrotoxininone, C<sub>10</sub>H<sub>14</sub>O<sub>7</sub>, which is more conveniently prepd. by heating the  $\alpha$ -deriv. under diminished pressure at 195°; this forms long anhydrous needles, freely sol. in H<sub>2</sub>O, decomp. sharply and without melting at 252-3°. Like the  $\alpha$ -compd., it is a dilactone with 2 free OH groups. In alc. it has  $[\alpha]_D^{17.5} 83^{\circ} 23'$ , and gives a *semicarbazone*, granular ppt. (+H<sub>2</sub>O), which commences to decomp. at 222°, darkens 240°, and subsequently passes into a product which decomp. above 300°, a *phenylhydrazone*, pale yellow ppt., decomp. definitely at 273° when rapidly heated, likewise an *oxime*, cubes decomp. sharply at 255°.  $\alpha$ - and  $\beta$ -picrotoxininone are converted by ice-cold 0.1 N aq. KOH into 2 different *dicarboxylic acids*, C<sub>10</sub>H<sub>14</sub>O<sub>8</sub>, which, however, show little tendency to crystallize. The  $\alpha$ -acid is characterized by its *phenylhydrazone*, yellow amorphous ppt., decomp. definitely at 220°; the  $\beta$ -acid was analyzed as the *silver salt* and as the *phenylhydrazone*, pale red needles decomp. at 140-1°.  $\alpha$ -Picrotoxininone is transformed by dil. KOH in MeOH into amorphous substances and picrotoxinonic acid, needles decomp. at 260°.  $[\alpha]_D^{17.5} 101^{\circ} 46'$  in EtOH (phenylhydrazine salt of the phenylhydrazone, pale yellow needles decomp. 208-7°), which is identical with the product prepd. by Hormann and Waechter (*C. A.* 10, 2694) from the ozonide of picrotoxinic acid. The same acid is also obtained by the action of boiling dil. H<sub>2</sub>SO<sub>4</sub> on  $\alpha$ - or  $\beta$ -picrotoxininone, or from the former by the prolonged action of cold concd. HCl. Picrotoxinin is converted by cold concd. HCl into 2 substances, one of which, amounting to about 50% of the material taken, remains undissolved; analyses agree with C<sub>10</sub>H<sub>14</sub>O<sub>8</sub>. Two of the O atoms are present in a lactone group, since the substance slowly dissolves in warm KOH (1 mol.), and the neutral soln. yields a *silver salt*, C<sub>10</sub>H<sub>13</sub>O<sub>7</sub>Ag, when treated with AgNO<sub>3</sub>. Its other properties, notably its sparing soly. in practically all the usual media, and its high temp. of decomp. (above 300°), suggest its identity with picrotoxinide prepd. by Schmidt (cf. *Ann.* 222, 313) by the action of HCl on picrotoxin in the presence of Et<sub>2</sub>O; attempts to prepare material for comparison by Schmidt's method were not, however, successful. It was not found possible to prep. an Ac or Bz deriv., or to estimate the number of OH groups. The 2nd substance is isolated by extg. the acid soln. with Et<sub>2</sub>O, or by evapg. it to dryness in a vacuum; the yield is not good, and the substance has not been obtained in the pure state. When dissolved in cold concd. AcOH and treated with an excess of PhNH<sub>2</sub>,



it gives a diphenylhydrazone,  $C_{24}H_{26}O_2N_4$ , pale yellow granules decomp.  $163^\circ$ .

W. O. E.

**Cantharidin. IX. Cantharolic acid.** J. GADAMER. *Arch. Pharm.* **258**, 171-82 (1920); *J. Chem. Soc.* 118, I, 859-61; cf. *C. A.* **9**, 2083.—Cantharolic acid is isolated as a by-product from the substances formed by the action of HBr in glacial AcOH on cantharidin. It occurs in the portion which is insol. in  $Et_2O$ , together with unchanged cantharidin and cantharic acid, from the latter of which it is sepd. by taking advantage of its very sparing soly. in boiling alc. It is an unsym., monobasic acid containing a lactone group and a free OH radical. Its structure and genetic relationships are indicated by the scheme:



*Cantharolic acid* crysts. in shining rhombs, m.  $254-6^\circ$  to  $258-60^\circ$  (decompn.), according to the rate of heating. It is very stable towards alk.  $KMnO_4$ . It behaves towards alkali as a monobasic acid. The presence of the lactone ring is demonstrated in the usual manner, and fission is found to be more complete than in the case of cantharic acid, but even here the process is complicated by the partial decompn. of the acid by excess of alkali. The OH could not be detected by  $PCl_5$ , but the acid is converted by cold concd.  $H_2SO_4$  into the *sulfuric ester* which was isolated in the form of the *barium salt*,  $C_{10}H_{12}O_6S.Ba.$ ,  $3H_2O$ . The free substance was not obtained, since in aq. soln. it somewhat undergoes autohydrolysis, with the production of cantharolic acid. The crude material could be resolved into its optical antipodes by brucine in  $H_2O$ , thus yielding very slender needles, and *brucine d-cantharolic acid sulfate*,  $C_{10}H_{14}O_6S$ ,  $2C_{22}H_{28}O_4.N_2.3H_2O$ , coarse plate-like needles. The brucine salts were converted into the corresponding  $NH_4$  salts, and from polarimetric analyses of the latter, the values  $[\alpha]_D -67.2^\circ$  and  $67.9^\circ$  are calcd. for the free acids in  $H_2O$ . Hydrolysis of the acids occurs slowly in boiling  $H_2O$ , but the cantharolic acid produced is almost completely racemized, the effect appearing, however, not to be due to the protracted exposure to a somewhat high temp. Cantharolic acid is converted by hot concd.  $H_2SO_4$  into cantharic acid. The resolution of *dl*-cantharolic acid has also been attempted by the fractional crystn. of the brucine salt from  $H_2O$ . The most highly active acid obtained had  $[\alpha]_D -31.25^\circ$  in  $H_2O$ , m.  $260-3^\circ$  (decompn.). The resolution is remarkable in that the salts only sep. when the concd. solns. are warmed, thus probably indicating the existence of a sol. hydrated and sparingly sol. anhydrous form of the salts, and, further, in that all the fractions yield extensively *l*-rotatory acids. The explanation of the latter phenomenon is found in the fact that while cantharolic acid itself is asym. in structure, its hydrate, formed by hydrolysis of the lactone, is sym. In  $H_2O$  an equil. exists between the lactone and hydrate, which is disturbed by the removal of a portion of the *l*-acid as the brucine salt. A portion of the hydrate, therefore, passes into the *dl*-acid, while simultaneously inactivation of the dissolved *d*-acid occurs through formation of the hydrate. In this manner, a complete conversion of the *dl*-acid into the *l*-acid can be effected through the sym. hydrate. In agreement with this explanation, it is found that *l*-cantharolic

acid becomes slowly racemized in  $H_2O$ , and that the same process occurs more rapidly in the presence of an excess of  $NaOH$ . In addition to *dl*-cantharolic acid, however, another optically inactive acid is formed in the latter circumstances, and this is produced exclusively when cantharolic acid is heated with alkali hydroxide on the  $H_2O$  bath. This acid is amorphous, and yields an amorphous  $Ca$  salt. Analyses taken in conjunction with its mode of formation indicate that it is 1,2-dimethylcyclohexadiene-carboxylic acid, but its physical properties suggest that it is a polymeride of this substance.

W. O. E.

"Furof green." OTTO FISCHER AND LUDWIG GRAHL. Univ. Erlangen. *J. prakt. Chem.* 100, 159-67 (1920).—The leuco base of "furof green," colorless needles, obtained by condensing  $PhNMe_2$  with furfural in the presence of  $ZnCl_2$  (cf. *Ann.* 206, 85 (1880)), m.  $83^\circ$ . The following derivatives were prepd: *dihydro-chloride*, colorless leaves which turn green in the air; *dihydrobromide*,  $C_{21}H_{24}ON_2 \cdot 2HBr$ , yellow leaflets; *dihydroiodide*, yellow leaflets; *sulfate*,  $2C_{21}H_{24}ON_2 \cdot 3H_2SO_4$ , needles de-comp.  $140^\circ$ ; *picrate*,  $C_{21}H_{24}ON_2$ , needles having a  $Cu$  luster; *picrolonate*,  $C_{21}H_{24}ON_2 \cdot 2C_{10}H_5O_4N_4$ , brownish yellow powder, m.  $174^\circ$  (decompn.); *methiodide*,  $C_{21}H_{24}ON_2 \cdot 2MeI$ , yellow crystals decomp. about  $210^\circ$ . On oxidation with  $PbO_2$  the leuco base yielded the corresponding dye; *bromide*,  $C_{21}H_{24}ON_2 \cdot Br \cdot 4H_2O$ , silky green needles; *iodide*, green needles. *Tetrachlyldiaminofuryldi-phenylmethane*,  $C_{21}H_{24}ON_2$ , white needles, m.  $80-1^\circ$ ; *hydroiodide*,  $C_{21}H_{24}ON_2 \cdot 2HI$ , aggregates decomp. about  $145^\circ$ ; *picrate*,  $C_{21}H_{24}ON_2 \cdot 2C_{10}H_5O_4N_4$ , light yellow needles decomp. about  $180^\circ$ ; *picrolonate*,  $C_{21}H_{24}ON_2$ , greenish yellow powder decomp. about  $155-6^\circ$ ; *methiodide*,  $C_{21}H_{24}ON_2 \cdot I_2$ , yellow prisms; *ethiodide*, white needles. The corresponding dye ("furof green Ae") gave an *iodide*,  $C_{21}H_{24}ON_2 \cdot I$ , green prisms decomp. about  $182-5^\circ$ ; *picrate*, dark bronze crystals. The carbinol base forms brown amorphous flocks. These dyes color silk, cellulose and wool a brilliant yellowish green, the latter being unstable to light.

D. BREWER JONES

Pyrrrole blacks. VIII. A. ANGELI AND C. LUTRI. *Atti accad. Lincei* 29, I, 420-30 (1920); cf. *C. A.* 14, 2788.—A black substance identical in compn. and properties with that obtained by the interaction of pyrrole and *p*-benzoquinone in presence of water is formed when this reaction takes place in  $AcOH$ . It is, therefore, probable that this substance represents an individual compd., and it is assumed that in its formation the quinoid and pyrrole rings unite. When treated with  $HNO_3$ , pyrrole yields intensely black products (cf. Angeli and Cusmano, *C. A.* 12, 365), and it is now found that the interaction of pyrrole and *p*-ONC $_6$ H $_4$ OH in cold  $AcOH$  gives an amorphous, deep violet-black powder insol. in the ordinary solvents, but sol. in alkalies, giving black soles; this powder has a compn. corresponding with the formula  $C_8H_8O_2N_4$  or  $C_8H_8O_2N_4$ , and appears to be formed according to one of the two equations:  $2C_4H_5N + 4C_6H_5ON = 3H_2O - H_2 = C_8H_8O_2N_4$  or  $2C_4H_5N + 4C_6H_5ON - 3H_2O = C_8H_8O_2N_4$ . Intensely colored products are formed also by the action of pyrrole on *p*-quinoneimine or *p*-quinonidine.

J. C. S.

Formation of naphthiminazoles from 1-nitroso-2-alkynaphthylamines. OTTO FISCHER, CURT DIETRICH AND FRIZORICH WEISS. *J. prakt. Chem.* 100, 167-75 (1920); *J. Chem. Soc.* 120, I, 57-8.—1-Nitroso-2-methylnaphthylamine, prepd. from nitroso- $\beta$ -naphthol and  $MeNH_2$ , m.  $148-9^\circ$ ; *hydrochloride*, yellow needles; *hydrobromide*, scarlet needles; *hydroiodide*, yellowish brown leaflets; *picrate*, yellow needles; *acetyl derivative*, yellow prisms, m.  $140-1^\circ$  (decompn.); *nitroso derivative*, yellow powder. On heating at  $100^\circ$  with alc.  $HCl$ , or preferably with  $ZnCl_2 + AcOH$ , the base is converted into 1,2-naphthiminazole (cf. Fischer and Hammerschmidt, *C. A.* 11, 1842). 1-Nitroso-2-propylnaphthylamine forms yellow leaflets decomp.  $116-8^\circ$ . 1-Nitroso-2-propylnaphthylamine, light green prisms, m.  $115^\circ$  (decompn.); *picrate*, yellow needles, decomp.  $235^\circ$ ; *acetyl derivative*, yellow leaflets, m.  $114^\circ$ . On heating with  $AcOH + ZnCl_2$  the base yields  $\mu$ -ethyl-1,2-naphthiminazole, needles, m.  $194^\circ$ , 1-Nitroso-2-butyl-naph-

thylamine, dark green needles, m. 98-9°; *picrate*, yellow needles, decomp. 244°; *acetyl derivative*, leaflets. *μ-Propyl-1,2-naphthiminazole*, needles, m. 87°. *1-Nitroso-2-iso-amylnaphthylamine*, leaflets, m. 82°, also yields a naphthiminazole.

D. BRÉSE JONES

The chelidonium alkaloids. II. (Estimation of the methylenedioxy group in alkaloids.) J. GADAMER. *Arch. Pharm.* 258, 148-67(1920); *J. Chem. Soc.* 118, I, 872; cf. *C. A.* 14, 1407.—The first part of the communication is devoted to a description of the exptl. evidence on which G. bases his formula for allocryptopine, a preliminary announcement of which has been made previously. Allocryptopine is converted by  $\text{PCl}_5$  into allocryptopine chloride, needles, m. 200-2°, which immediately develops a dark violet color with concd.  $\text{H}_2\text{SO}_4$ , and this is identical in all respects (the mixt. m. 199-202°) with the product obtained by the action of  $\text{KCl}$  on dihydroberberine methosulfate; further, isallocryptopine chloride is transformed by  $\text{AgMeSO}_3$  into a product m. 195-8°, identical with dihydroberberine methosulfate, m. 197-200° (cf. Perkin, *C. A.* 11, 147). Again, allocryptopine is reduced by  $\text{Na-Hg}$  in  $\text{H}_2\text{SO}_4$  to dihydroallocryptopine, m. 167-8°, which is converted by  $\text{PCl}_5$  into isodihydroallocryptopine chloride, m. 248-50° (decompn.), identical with tetrahydroberberine methochloride, m. 249-51° (decompn.), and the identity of the compds. is confirmed by comparison of their bromides. When the *O*-Ac deriv. of chelidonine is oxidized with  $\text{Hg}(\text{OAc})_2$ , a colorless non-basic substance is obtained, which, particularly in acid soln., gradually acquires an intensely reddish yellow color analogous to that of dihydrochelerythrine described by Karrer (cf. *C. A.* 11, 2798). Chelerythrine, itself can, however, scarcely be directly related to chelidonine, but appears to be closely allied to  $\alpha$ -homochelidonine. A preliminary examn. of the subject reveals the following facts. Chelerythrine contains 2MeO and 1 methylenedioxy groups. A keto group cannot, therefore, be present, and the reactions considered by Karrer to be due to the CO group are to be regarded as occurring in the same manner as with cotarnine and berberine. Karrer's assumption of the elimination of a chain,  $\text{C}_6\text{H}_4\text{O}$ , in the formation of chelalbine compds. is highly improbable, and in this connection it is to be noted that berberine yields additive compds. with Grignard's reagents. In its salts, chelerythrine is a quaternary base, the properties of which are due to the N atom, not to the basic O as postulated by Karrer. The free  $\text{NH}_4$  base appears incapable of existence; when the salts are treated with alkali, it immediately passes into the colorless carbinol base. It is extremely probable that an analog of chelerythrine exists in nature which forms a chloride,  $\text{C}_{26}\text{H}_{18}\text{O}_4\text{NCl}$ , differing from sanguinarine chloride,  $\text{C}_{26}\text{H}_{18}\text{O}_4\text{NCl}$ , by 2 less H atoms, and it appears to have been occasionally mistaken for the latter. The substance ultimately obtained from *O*-acetylhomochelidonine m. 160-2°, and is identical with dihydrochelerythrine obtained by Karrer's method from an authentic specimen of chelerythrine (Karrer gives the m. p. 14-34°, but his product is shown to be contaminated with impurities present in Merck's prepn. from *Sanguinaria canadensis*). The identity of the products is further established by the fact that the material from either source becomes oxidized on exposure to air to chelerythrine, which is identified as the cyanide, m. 258° (for which Karrer gives varying m.ps.). [With WINTERFELD].—Under the action of concd.  $\text{H}_2\text{SO}_4$ , substances containing the methylenedioxy group readily lose  $\text{CH}_2\text{O}$ , which is capable of further condensation; its action on phloroglucinol has been adapted by Weber and Tollens to the qual. detection and quant. estimation of the  $\text{CH}_2\text{O}_2$  group, and the reaction has been occasionally applied to alkaloids (cf. Gaebel, *C. A.* 4, 2544), with which, however, it does not give very definite results. The method has been investigated further, and the following process is recommended. To 0.3 g. pure phloroglucinol in a warm mixt. of 15 cc.  $\text{H}_2\text{O}$ , and 15 cc. concd.  $\text{H}_2\text{SO}_4$ , the weighed quantity of alkaloid in 5 cc.  $\text{H}_2\text{O}$  is added. The mixt. is shaken until a clear soln. is obtained, and treated with 10 cc. concd.  $\text{H}_2\text{SO}_4$ . The flask is closed with a funnel and heated over a wire

gauze until the soln. boils gently and a ppt. begins to form. It is then warmed in the water bath at 70–80° for 3 hrs. After 24 hrs., the ppt. is filtered, through a gooch, washed with 60 cc. H<sub>2</sub>O, dried at 100° for 4 hrs., and weighed. The wt. of phloroglucide divided by 9.85 gives the amount of CH<sub>2</sub>. The method has several sources of error, and should, therefore, be effected with differing amts. of alkaloid and occasional blank expts. The results are to be regarded as minimal values. The markedly low values are due to the fact that the eliminated CH<sub>2</sub>O only combines in part with the phloroglucinol to yield an insol. phloroglucide, while another portion combines with the alkaloid or with alkaloid and phloroglucinol. The basic substances naturally remain dissolved in the acid, but may be partly pptd. when the latter is dild. with H<sub>2</sub>O (the ppt. should be thoroughly drained when washing is commenced). The frequent observation during the examn. of the color reactions of alkaloids with concd. H<sub>2</sub>SO<sub>4</sub> that the mixt. becomes turbid on exposure to moisture (*e. g.*, with bulbocapnine), thus receives its explanation. In general, the method is sufficiently accurate to allow a decision as to whether 1 or 2 CH<sub>2</sub>O<sub>2</sub> groups are present. Two such groups are thus shown to be contained in chelidinine, corycavine and corycavamine, and one in corycavidine.

W. O. E.

**Chelerythrine.** K. H. BAUER AND K. T. REDINGER. *Arch. Pharm.* 258, 187–70 (1920); *J. Chem. Soc.* 118, I, 874.—For the prepn. of the alkaloid (prisms from alc. m. 207°); the total alkaloids from the *sanguinaria* root are mixed with milk of lime, the product is dried, and extd. with a mixt. of equal parts of Et<sub>2</sub>O and C<sub>6</sub>H<sub>6</sub>. The alkaloids are removed from the ext. with citric acid, and subsequently pptd. with NH<sub>3</sub>, and again dissolved in C<sub>6</sub>H<sub>6</sub>. The residue obtained after removal of the latter is repeatedly crystd. from EtOH. The following salts have been prepd. Hydrochloride, C<sub>11</sub>H<sub>17</sub>O<sub>2</sub>N.HCl.H<sub>2</sub>O, egg-yellow needles (*cf.* Schmidt, Koenig and Tietz, *Arch. Pharm.* 231, 136; Fischer *Arch. Pharm.* 239, 409; Karrer *C. A.* 11, 2798); hydroiodide, anhydrous dark red needles, which become pale brown at 150–60°; tartrate, anhydrous dark red crystals arranged in rosettes; oxalate, reddish yellow needles; methyl sulfate, C<sub>11</sub>H<sub>17</sub>O<sub>2</sub>N.2Me<sub>2</sub>SO<sub>4</sub>.3MeOH, short golden yellow needles. Contrary to the observation of Tietz, chelerythrine hydroiodide or hydrochloride does not evolve MeI when treated with HI at a temp. below 125°, and hence the alkaloid does not contain a MeO group. On the other hand, evolution of MeI is observed at 145° and again at 275° in the estn. of the methylimino groups in the hydroiodide (at 165° and 245°, resp., with the hydrochloride), thus indicating the presence of the Me<sub>2</sub>N group. Chelerythrine absorbs 2 atoms of H when catalytically hydrogenated in the presence of colloidal Pd, but the product has not as yet been obtained in the pure state.

W. O. E.

**Ethyl chloride as an ethylating agent.** THOS. CALLAN. *Chem. Age* (London) 3, 557 (1920).—C. disagrees with A. Henning, who states that practically every com. ethylation can be accomplished with EtCl at about 100° and 160 lbs. pressure.

G. W. STRATTON

**Chroman series.** I. ANNIE GREENWOOD AND MAX NIERENSTEIN. *Univ. Bristol J. Chem. Soc.* 117, 1594–9 (1920).—After heating for 8 hrs. on the H<sub>2</sub>O bath a soln. of 11.5 g. of 1-phenylchroman (A), prepd. according to Harries and Busse's method (*Ber.* 29, 380 (1896)) in 150 cc. alc. to which 50 g. Na was added and removing the alc. with steam 4.5 g. of unchanged A was recovered, which was again reduced, with 20 g. Na and 100 cc. alc. The aq. exts. from these reductions on acidification with dil. H<sub>2</sub>SO<sub>4</sub> and extn. with Et<sub>2</sub>O gave a 69% yield of 2-hydroxy- $\alpha,\gamma$ -diphenylpropane, slender glistening needles from light petroleum, m. 21.5°. Its alc. soln. turned violet with alc. FeCl<sub>3</sub>. Its Et<sub>2</sub>O soln. with CH<sub>3</sub>N<sub>2</sub> gave an 86% yield of the methyl ether, a viscous colorless oil b<sub>11–12</sub> 143–7°. A soln. of 22 g. of 3-phenylidihydrocoumarin, prepd. by the action of AcCl on an AcOH soln. of 2-methoxy- $\beta,\beta$ -diphenylpropionic acid (Fosse, *C. A.* 14, 1963), in 175 cc. alc. boiled 8 hrs. with 50 g. Na gave, after the removal of alc. with steam,

on extrn. with  $\text{Et}_2\text{O}$  a 68% yield of *2- $\omega$ -dihydroxy- $\alpha,\alpha$ -diphenylpropane* (B), a colorless heavy oil sol. in the usual org. solvents,  $b_D^{20}$  197–9°. *3-Phenylchroman* (C), long prismatic needles from light petroleum, m. 38.5°, sol. in the usual organic solvents, was obtained in 78% yield by passing dry HCl into 16 g. of B in 100 cc. abs. alc. on a  $\text{H}_2\text{O}$  bath, then concg. the soln. to 20 cc., dilg. with 300 cc.  $\text{H}_2\text{O}$  and extg. the oil which sepd. with  $\text{Et}_2\text{O}$ . A reddish violet color was produced when  $\text{FeCl}_3$  was added to a suspension of C in concd.  $\text{H}_2\text{SO}_4$ . Under the same conditions chroman and A gave a faint violet color. The  $\text{Et}_2\text{O}$  ext. from the acidified soln. obtained by the reduction of 9 g. of C in 150 cc. alc. with 40 g. Na gave a 71% yield of *2-hydroxy- $\alpha,\alpha$ -diphenylpropane* (D), a viscous colorless oil sol. in the usual organic solvents,  $b_D^{20}$  214–6°. Its alc. soln. turned violet with alc.  $\text{FeCl}_3$ . Its  $\text{Et}_2\text{O}$  soln. with  $\text{CH}_3\text{N}_3$  gave a 74% yield of the *methyl ether* a viscous colorless oil  $b_D^{20}$  176–9°. The acidified soln. obtained from the action, for 4 hrs., of 5 g.  $\text{KMnO}_4$  in 100 cc.  $\text{H}_2\text{O}$  on 5 g. of D in 100 cc. of 20% KOH, on extrn. with  $\text{Et}_2\text{O}$  gave a 64% yield of 2-hydroxydiphenylacetic acid, m. 88–7°, which with  $\text{Ac}_2\text{O}$  and  $\text{NaOAc}$  gave a quant. yield of 2-phenylcoumaran-1-one. The names depsan for *p*-benzylcoumaran, depsanol for leuco-*p*-benzoylcoumaran and tetrahydroxydepsanol for catechin should no longer be used, since the name depside has become associated with a series of anhydrides, catechin does not possess tanning properties as is indicated in the name given and most recent researches point to a chroman rather than a coumaran formula for catechin.

G. W. STRATTON

The hydrates of pyridine. PARISELLE. *Compt. rend.* 172, 673–6 (1921).—Nine compds. of  $\text{C}_5\text{H}_5\text{N}$  (A) and water have been mentioned. Goldschmidt (*Ber.* 16, 276, (1883)) mentioned a compd. corresponding to  $\text{A}+3\text{H}_2\text{O}$  (B). This seems to be really  $\text{A}+3.35\text{H}_2\text{O}$ ,  $b_D^{18}$  18°. Gouy (*Ann. chim. phys.* [8] 9, (1906)) adheres to the existence of B as a result of a study of surface tension of these mixts. Henry reported the compd.  $\text{A}+\text{H}_2\text{O}$  (*Bull. acad. Belgique* 27, 464).  $2\text{A}+3\text{H}_2\text{O}$ ,  $2\text{A}+5\text{H}_2\text{O}$ ,  $\text{A}+5\text{H}_2\text{O}$ ,  $\text{A}+10\text{H}_2\text{O}$  and  $\text{A}+40\text{H}_2\text{O}$  have been mentioned by Dunstan, Thole and Hunt (*J. Chem. Soc.* 91, 83, 1728 (1907)) who constructed a curve of the coeff. of viscosity of an aq. soln. of A as a function of concn. Baud (*C. A.* 3, 1485) from a study of f. ps., has obtained data indicating the existence of  $\text{A}+2\text{H}_2\text{O}$  (C) and  $\text{A}+6\text{H}_2\text{O}$  but later (*C. A.* 4, 703) makes no mention of the compd.  $\text{A}+6\text{H}_2\text{O}$ . P. points out that only a limited amt. of confidence should be placed in the analysis of crystals m. –50°. To confirm the existence of C Baud studied the contraction of mixts. of  $\text{H}_2\text{O}$  and A at 0° and he found a max. of d. corresponding to the compd.  $\text{A}+2.3\text{H}_2\text{O}$ . P. points out that  $\text{H}_2\text{O}$  at 0° shows variations in dilation and he chose the temp. of 17°. At this temp. the compd. indicated is  $\text{A}+3\text{H}_2\text{O}$  ( $d_4^{17}$  1.0097) and at 25°  $\text{A}+3.3\text{H}_2\text{O}$  ( $d_4^{25}$  1.0042).

H. E. WILLIAMS

Completely methylated quinic acid. J. HERZIG AND H. ORTNY. *Arch. Pharm.* 258, 91–6 (1920); *J. Chem. Soc.* 118, I, 878–9.—Exceptional difficulties have previously been encountered in methylating quinic acid; It is now found, however, that by repeated treatment with MeI and  $\text{Ag}_2\text{O}$  slow conversion into *methyl tetramethylquinatate* may be effected, rhombic crystals,  $a:b:c=0.67:41:1.05960$ , m. 56–8°,  $[\alpha]_D^{20}-18.5^\circ$  in  $\text{C}_6\text{H}_6$ ; the ester decomps. to some extent when distd. in a vacuum. Attempts to hydrolyze it by alkali or by aq. HCl did not proceed smoothly, a portion of the ester remaining unattacked, while another portion lost the ethereal MeO groups to a greater or less extent. Oxidation with  $\text{CrO}_2\text{-AcOH}$ , or with alk.  $\text{KMnO}_4$  yields a mixt. of unchanged ester and highly oxidized substances. It is not readily dehydrogenated by I. Attempts to effect methylation with MeI and MeOH in the presence or absence of a little Cu or Au were not more successful. The action of  $\text{CH}_3\text{N}_3$  is rapid at first, but subsequently very slow, so that the prepn. of a completely methylated product in this manner is very difficult, if at all possible. The application of Purdie's method to other cases of difficult methylation has also been investigated. 2,4,6-Trihydroxy-1,1,2,3,3,4,5,5,6-nonamethylcyclohexane (cf. Herzig and Erthal, *C. A.* 5, 3437) is fairly readily converted into a

mono-MeO deriv. (which could not be isolated in the pure state, owing to lack of material), but a further marked increase in the MeO content is not effected by 11 successive treatments of the product with MeI and  $\text{Ag}_2\text{O}$ . Quercitrol could not be methylated under widely varied conditions. It does not appear possible to replace the  $\text{Ag}_2\text{O}$  by  $\text{PbO}$ .  
W. O. E.

Investigations on the existence of glucose-salt combinations (HELDERMAN) 28. Recovery of ethylene and ethyl alcohol from the gases of dry distillation (WASSER) 21. Constitution of cellulose (HIBBERT) 23. Chlorination of natural gas (JONES, *et al*) 21. Review of the most important articles in the field of pure sugar chemistry published during the second half of 1920 (LIPPMAN) 28.

FRY, H. S.: The Electronic Conception of Valence and the Constitution of Benzene. London: Longmans Green & Co. 300 pp. 16s.

WYLL: Les méthodes de la chimie organique. Traité concernant les travaux de laboratoire. Translated by R. Cornubert. Vol. 4, 2nd part. Paris: Dunod. 600 pp. 70 fr. For review see *Ann. chim. anal. chim. appl.* 3, 131(1921).

Catalyst for producing ethylene. A. A. BACKHAUS. U. S. 1,372,736, Mar. 29. A catalyst for producing  $\text{C}_2\text{H}_4$  from  $\text{EtOH}$  at  $300^\circ$  is prepd. by impregnating coke with sirupy  $\text{H}_3\text{PO}_4$  in excess, by use of vacuum and vacuum-release, and then reducing the  $\text{H}_3\text{PO}_4$  content of the coke to about 15% the wt. of the entire mass.

Hydroxy aldehydes. H. HAAKE. Brit. 157,850, Jan. 10, 1921. Hydroxy aldehydes are prepd. by the reaction of phenols or their derivs. with  $\text{HCHO}$ , or a compd. yielding it, in the presence of a nitroso compd. and an acid condensing agent. Examples are given of the prepn. of salicylaldehyde and *p*-hydroxybenzaldehyde, 2-hydroxy-5-methylbenzaldehyde, anisaldehyde, vanillin, protocatechualdehyde, and the aldehyde from 2-naphthol-3,4-disulfonic acid; the nitroso compds. specified are  $\text{ONC}_6\text{H}_4\text{NMe}_3$ ,  $\text{ONC}_6\text{H}_4\text{NEt}_3$  and  $\text{ONC}_6\text{H}_4\text{OH}$ .  $\text{HCl}$  is employed as condensing agent.

Ethyl alcohol. BADISCHE ANILIN- und SODA-FABRIK. Brit. 158,906, Feb. 9, 1921.  $\text{EtOH}$  is prepd. by passing  $\text{AcH}$  vapor and  $\text{H}$  over finely divided  $\text{Cu}$ , obtained by the reduction of pptd.  $\text{Cu}$  compds. preferably at a low temp. The  $\text{Cu}$  catalyst is prepd., *e. g.*, by pptg. a bot soln. of a  $\text{Cu}$  salt by means of caustic alkali, mixing the ppt. with pumice stone, and reducing the  $\text{Cu}(\text{OH})_2$  with  $\text{H}$  at  $200^\circ$ .

Diethyl sulfate. N. V. SIDGWICK and S. G. P. PLANT. Brit. 157,578, Oct. 30, 1919.  $\text{Et}_2\text{SO}_4$  is prepd. by passing  $\text{C}_2\text{H}_4$  in great excess into  $\text{H}_2\text{SO}_4$  containing 80–100%  $\text{H}_2\text{SO}_4$  or into oleum containing up to 90%  $\text{SO}_3$  at a temp. not exceeding  $120^\circ$ .  $\text{EtHSO}_4$  is first formed and this is converted into  $\text{Et}_2\text{SO}_4$  by continuing the introduction of  $\text{C}_2\text{H}_4$  until the wt. of the reaction mixt. has increased by at least 20% of the wt. of  $\text{H}_2\text{SO}_4$  present.  $\text{EtHSO}_4$  prepd. in any known manner may be used in the first instance as the absorbent for the  $\text{C}_2\text{H}_4$ .

Halohydrocarbons. I. PFRIER. Brit. 157,253, Jan. 10, 1921. Hydrocarbons are mixed with halogens, if necessary with addition of an inert gas, and allowed to react at  $150$ – $500^\circ$  in presence of metals or salts of metals like  $\text{Fe}$ ,  $\text{Cu}$  and  $\text{Sb}$  which form two series; the resulting halogen compds. may be sep'd. in the known manner. The production of mixts. of  $\text{MeCl}$  and  $\text{CH}_2\text{Cl}_2$ ,  $\text{CH}_3\text{Cl}$  and  $\text{CHCl}_3$ ,  $\text{CH}_3\text{Cl}$  and  $\text{CCl}_4$  from  $\text{CH}_4$  and  $\text{Cl}$  in the presence of  $\text{FeCl}_3$  is mentioned.

Glyoxal. A. WOYL and K. BRAUNIC. Brit. 157,329, Jan. 10, 1921. Glyoxal is prepd. by the action of ozone on  $\text{C}_2\text{H}_2$  dild. with air,  $\text{H}_2$ ,  $\text{CO}_2$  or other indifferent gas at ordinary temps.; water vapor or spray may be introduced into the reaction mixt. and the glyoxal recovered as an aq. soln.

Phenyl ether. J. M. JOHLIN. U. S. 1,372,434, Mar. 22.  $\text{Ph}_2\text{O}$  is prepd. by heat-

ing  $\text{PhSO}_3\text{Na}$  with  $\text{NaOH}$  in such proportions as to leave an uncombined portion of sulfonate at a temp. suitable to form  $\text{PhONa}$ , and then continuing the reaction at a temp. of about  $420^\circ$  in order to effect reaction between the uncombined sulfonate and the  $\text{PhONa}$ .

**Borneol.** FABRIQUES DE PRODUITS CHIMIQUES DE THANN ET DE MULHOUSE. Brit. 158,533, Nov. 1, 1920. Addition to 144,604 (C. A. 14, 2936). In the process for the manuf. of borneol described in the principal patent by heating oil of turpentine with tetrachlorophthalic acid and hydrolyzing the resulting ester, the formation of the bornyl tetrachlorophthalate is facilitated by the presence of an org. solvent, such as an ether like anisole, a ketone, or an aromatic ester. The reaction may take place under pressure or not.

**Conversion of pinene compounds into isobornyl ester and camphene mixture.** L. G. WESSON. U. S. 1,372,382, Mar. 22. Pinene-HCl is mixed with glacial HOAc in the proportions of 100 to 300 parts, a small quantity of rather coarse Zn powder (preferably about 2 parts) is added after the mixt. has been heated to vigorous boiling under a reflux condenser and the boiling is continued for about 18 hrs. The Zn slowly dissolves and a large proportion of the HCl is evolved as a gas and is recovered. After about 18 hrs. the mixt. will usually contain about 83-85 parts of isobornyl acetate, 10 parts of camphene, 5 parts of camphene-HCl and 10 parts or less of unconverted pinene-HCl. A mixt. of isobornyl acetate, camphene and camphene-HCl is sepd. by fractional distn. *in vacuo* and this mixt. may be employed for the production of synthetic camphor. The use of such a small amt. of Zn and the avoidance of unduly high temps. or more prolonged heating obviate the formation of any considerable quantity of resinous substances. Instead of HOAc, formic, propionic, stearic, benzoic or salicylic acids or other acids may be used and instead of pinene-HCl the hydrobromide or hydrofluoride are suitable for carrying out similar reactions.

**Camphylcarbinol.** H. RUPF. Brit. 157,227, Jan. 8, 1921. Camphylcarbinol is prepd. by reducing oxymethylenecamphor in soln. in alc., aq. alc., or HOAc, or as neutral alkali salt in aq. soln., by means of H in the presence of finely divided Ni or Co.

## 11—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR., AND WILLIAM J. GIES

### A—GENERAL

FRANK P. UNDERHILL

**Phagocytosis of solid particles.** I. Quartz. WALLACE D. FENN. *J. Gen. Physiol.* 3, 439-64 (1921).—A new quant. method of measuring phagocytosis is described, based upon counting the number of particles *not* taken up by the leucocytes. The speed with which 3 suspensions each composed of different sized quartz particles should be ingested by leucocytes is calcd. from the chances of collision between leucocytes and quartz particles, and the predictions are verified experimentally. II. Carbon. *Ibid* 465-83. Using 2 different C suspensions and measuring the diam. and velocity of the leucocytes and the particles, the relative rates of C ingestion are calcd. and verified. Particles of C  $4.7\mu$  in diam. are ingested as readily as those  $3.2\mu$ . The more rapid *apparent* rate of ingestion of the  $4.7\mu$  particles is due to their greater *availability* rather than the greater *capability* of the leucocytes. In absence of serum or in heated serum, there is almost no phagocytosis; a protective colloid is necessary to keep the C particles distinct in the 0.9 per cent. soln. of NaCl. The clumping of unwashed leucocytes is accelerated by serum and by the ingestion of C. The available evidence indicates that the *phagocytosis of bacteria* does not follow the law for a monomol. reaction, possibly because of the toxic effect of bacterial exts. upon the leucocytes. J. A.

The free amino groups of proteins. III. S. EDLSCHER. *Z. physiol. Chem.* 110, 153-5(1920); cf. C. A. 14, 1811.—In contradiction to Herzig and Landsteiner, the action of  $\text{Me}_2\text{SO}_4$  on proteins produces not only monomethyl derivs. but also products of higher methylation. Monomethyl derivs. are the only products when protein is treated with dimethyl sulfate. No products of the higher methylation were detected. Remarks on the above. I. HAZZIG. *Ibid* 156-7.

H. V. ATKINSON

The proteins and colloid chemistry. JACQUES LOEB. *Science* 52, 449-56(1920).—An address. (1) A number of authors have tried to explain the behavior of proteins from the viewpoint of the newer concepts of colloid chemistry, i. e., that these substances do not act by chem. forces of valence, but follow the rules of adsorption. Those who have advocated the purely chem. view of these phenomena have not been able to show that ions combine with protein in the typical ratio in which the same ions combine with crystalloids. This proof only becomes possible when it is recognized that the  $P_H$  of the protein soln. det. the amt. of ion combined with the protein, and the true comparison of one ion with another can only be made at the same  $P_H$ . The Hofmeister series of ions and Pauli's series of acids present anomalies for this reason. Such series have no real existence owing to the fact that the  $P_H$  of the solns. was not measured. (2) Only the cation or the anion, or neither, can combine with protein. Which of these 3 conditions is attained depends on the  $P_H$  of the soln. Gelatin, for example, at  $P_H = 4.7$  (isoelec. pt.) combines with neither ion; at  $P_H > 4.7$  only with cations (Na gelatinate); at  $P_H < 4.7$ , only with anions (gelatin chloride). This can be clearly shown when powdered gelatin, brought to various  $P_H$  values, is treated on a filter with a neutral salt soln. and the excess of salt washed away. The expts. are most striking when salts one of whose ions give decided qual. tests are used, e. g.,  $\text{AgNO}_3$ ,  $\text{NiCl}_2$ ,  $\text{K}_4\text{Fe}(\text{CN})_6$ ,  $\text{NaCNS}$ , etc. It follows that concn. does not define a protein soln.— $P_H$  must also be stated. The exptl. work described below was done with isoelec. gelatin, given the desired  $P_H$  by addition of acid or alkali. (3) When acid is added to isoelec. gelatin (or other protein), equil. is established between acid, gelatin-acid salt, isoelec. gelatin; when alkali is added equil. is established between metal gelatinate, isoelec. protein, hydrogen ions. (4) The chem. nature of this union is shown by the fact that 3 times as many cc. of 0.1  $N$   $\text{H}_3\text{PO}_4$  are required to bring 100 cc. 1% gelatin soln. to a given  $P_H$  as are required in the case of  $\text{HCl}$  or  $\text{HNO}_3$ , twice the no. of cc. of 0.1  $N$  oxalic and the same number of cc. of 0.1  $N$   $\text{H}_2\text{SO}_4$  (as both the H atoms in  $\text{H}_2\text{SO}_4$  are fairly strongly dissociated). Analogous results are shown with bases, and with both bases and acids in the case of cryst. egg albumin. (5) The most important fact is that from these combining ratios, the phys. properties of proteins can be predicted. It is found that any acid whose anion combines as a monovalent ion ( $\text{Cl}^-$ ,  $\text{H}_3\text{PO}_4^-$ ) raises the osmotic pressure, viscosity and swelling of protein approx. twice as much as one whose ion combines as bivalent ion, ( $\text{SO}_4^{--}$ ). The same rule holds for cations. Curves are shown in which  $P_H$  is plotted against magnitude of certain phys. properties (e. g. swelling) and almost identical effects are seen with chloride, bromide, nitrate, tartrate, succinate, citrate, phosphate, with minimum at  $P_H = 4.7$ , and max. at about  $P_H = 3.2$ ; gelatin sulfate gives parallel curve, but max. value only half that obtained above. These facts are contradictory to the Pauli or Hofmeister series, owing to the fact that  $P_H$  was not measured in the solns. studied by P. and H. As would be expected more of a weak acid is needed to bring a given gelatin soln. to a given  $P_H$  than of a strong acid, but when this  $P_H$  is reached the gelatin is in each case in combination with the same amt. of acid, and the 2 solns. show the same osmotic pressure. Protein salts with ions of the same valence show at the same  $P_H$  like phys. properties. "The behavior of the proteins, therefore, contradicts the idea that the chemistry of colloids differs from the chemistry of crystalloids."

H. W. BANKS, 3RD.

Chemical and physical behavior of casein solutions. JACQUES LOEB. Rockefeller



*Inst. J. Gen. Physiol.* 3, 547-55(1921).—Pure casein was prepd. according to the method of Van Slyke and Baker (*C. A.* 12, 1982). It was then made up in 1% solns. and used in the tests. Like gelatin and cryst. egg albumin (cf. Loeb, *C. A.* 13, 1597; 14, 3682; 15, 540; and preceding abst.), casein combines with weak dibasic and tri-basic acids in mol. proportions. With certain acids, e. g.,  $\text{H}_2\text{SO}_4$ , oxalic and triacetic, the corresponding casein salts are so sparingly sol. that the same relations do not hold. The values of osmotic pressure for casein chloride and phosphate solns. at the same  $P_H$  and concn. of original isoelec. casein are practically identical; the same is true of the viscosity of the respective solns. Casein also combines in equiv. proportions with the bases  $\text{NaOH}$ ,  $\text{KOH}$ ,  $\text{Ca}(\text{OH})_2$  and  $\text{Ba}(\text{OH})_2$ . Na and K caseinates give almost identical osmotic pressure curves. On account of the incomplete soly. of Ba and Ca caseinates between  $P_H$  4.7 and 10.5 it is not possible to draw any conclusions from the relative osmotic pressures and viscosities of metal caseinates having univalent and bivalent cations between these H-ion concns. L. concludes that these expts. with casein confirm previous work with gelatin and egg albumin in showing that the same forces of primary valency which det. the reaction between acids and alkalies with crystalloids are also effective here, and that valency and not the nature of the ion in combination with the protein det. the effect on the physical properties of the protein. CHAS. H. RICHARDSON

Susceptibility of saccharase (invertase) to heat. H. VON EULER AND I. LAURIN  
*Z. physiol. Chem.* 108, 64-115(1919).—See *C. A.* 14, 2344. E. J. C.

Importance of the infinitely little. W. D. HALLIBURTON. London. *Lancet* 1921, I, 627-30.—A review of the development of the theories of hormones and internal secretion, including the chem. constitution of internal secretions, endocrine balance and accessory food factors as examples of the importance of minute quantities of certain substances in the human economy. E. B. FINKE

Calorimetric studies on melanins. II. F. v. HOEFFT. *Biochem. Z.* 106, 207-11 (1920).—When levulose and cellulose are digested for 6 hrs. with concd.  $\text{HCl}$  there is left a red-brown residue representing some 25% of the carbohydrate. This is insol. in  $\text{H}_2\text{O}$  and acid, but sol. in alkali and has a fuel value of 5100 cal. The filtrate contains no reducing substances. When dihydroxyphenylalanine is similarly treated only a light yellowish soln. results. The compd. in alk. soln. turns dark brown; this color change is hastened at the anode on electrolysis. On acidification this colored soln. gives rise to a blackish oil, which can again be dissolved in  $\text{H}_2\text{O}$  with a residue of yellowish flocculi. Similar phenomena occur with phenol and tyrosine. On the basis of these and allied observations and since bumins may or may not contain N, H. is of the opinion that all these products are only the result of condensation processes of cyclic compds. F. S. HAMMETT

Theory of invertase action. I. MICHAELIS AND M. ROTHSTEN. *Biochem. Z.* 110, 217-33(1920).—Studies are reported of the action of invertase on concns. of sucrose ranging from 2 to 40% in acetate or phosphate-buffered solns. of widely varying  $P_H$  values. The results of the observations, which are given in tabular detail, lead to the conclusion that invertase combines with 1 mol. of sucrose, thus forming an acid having, a dissociation const. of  $3 \times 10^{-7}$ . Under the conditions of the exptl. observations (low salt content of the solns. and absence of substances which might act as marked colloid precipitants) the acid appears to be molecularly dispersed and dissociated just as is a genuine dissolved acid. The undissociated mols. of the acid occur spontaneously in the products of the enzymic processes, the anions of which are obtainable. These facts are taken as explaining the influence of the  $P_H$  on the enzyme activity between a  $P_H$  of about 3.5 up to the alk. side. The decrease in activity when  $P_H < 3.5$  is a subject of further significance. (Cf. *C. A.* 14, 3178). F. S. HAMMETT

Studies of the influence of temperature on enzymes, especially rennin and pepsin. A. KÖNIG. *Biochem. Z.* 110, 266-88(1920).—The results of these expts. which are

given in tabular detail may be briefly summarized. Rennin in dil. soln. is strongly influenced by increase in temp. and responds to such increase as thrombin does. When the enzyme is in glycerol soln. it withstands high temps. for a longer period than when in aq. soln. and can be shown to be undiminished in activity at 40° in this condition. Moreover, concd. rennin ext. is more resistant to temp. increases than is the dil. H<sub>2</sub>O soln. Milk apparently contains protective substances which tend to retard the destructive action of increasing temp. on rennin so that this is not made evident until a temp. of 45° is reached. When pepsin in H<sub>2</sub>O soln. was studied with respect to its digestive action on casein, it was found that the enzyme soln. can withstand a temp. of 40° but is weakened when exposed to 45°. The starch-splitting action of diastase remains unchanged at temps. from 5° to 40° but at 45° destruction of activity is made evident. Rennin and pepsin, on account of the differences observed in their reactions to rising temps., are considered as 2 separate enzymes.

F. S. HAMMETT

**Tripeptide from casein which contains tryptophan.** S. FRÄNKEL AND E. NASSAU. *Biochem. Z.* 110, 287-98(1920).—When 500 g. casein are hydrolyzed for 24 hrs. with 2 l. of 10% KOH at the boiling temp. it is possible to obtain from the reaction products an optically inactive Ba salt of a tryptophan-containing tripeptide, in which 2 tryptophan mols. are combined with CH<sub>3</sub>CH<sub>2</sub>NH<sub>2</sub>CO<sub>2</sub>H in an acid-amide union, as shown by the detn. of the free amino groups by the Van Slyke method of analysis (cf. C. A. 6, 3431, 3433). If the Ba salt has 12 mols. of H<sub>2</sub>O of crystn. the compn. of the compd. is C<sub>40</sub>H<sub>48</sub>N<sub>10</sub>O<sub>14</sub> while the tripeptide is then C<sub>16</sub>H<sub>17</sub>N<sub>3</sub>O<sub>6</sub> and the assumption of the make-up of the compd. out of 2 mols. tryptophan C<sub>11</sub>H<sub>9</sub>N<sub>2</sub>O<sub>3</sub> and 1 mol. alanine C<sub>3</sub>H<sub>7</sub>N<sub>1</sub>O<sub>2</sub> with the elimination of 2 mols. of H<sub>2</sub>O is justified. The exact configuration of the compd. is as yet undetd. A detailed description of the method of prepn. is given.

F. S. HAMMETT

**Are there defensive enzymes against polysaccharides?** E. HERRZFELD AND R. KLINGER. *Biochem. Z.* 114, 27-32(1921).—Starch, glycogen, gum arabic, and inulin in 2% concn. were severally subcutaneously injected in H<sub>2</sub>O soln. into dogs and rabbits and some time later samples of blood were withdrawn and tested for polysaccharide-splitting power with the injected carbohydrate by incubating at room temp. under toluene. The results of the expts. indicate that the idea of the presence of sp. defensive enzymes for the destruction of polysaccharides introduced into the body has not been confirmed.

F. S. HAMMETT

**The influence of sodium fluoride on the activity of pancreatic diastase.** S. LANG AND H. LANG. *Biochem. Z.* 114, 165-93(1921).—Beef pancreas, ground with sand, and extd. with CHCl<sub>3</sub>-water, centrifuged and filtered before using, was the source of the diastase studied. Oat and sol. starch were used as the substrate. Various mixts. of the enzyme and starches were made and the effect of different amts. of NaF on the maltose and glucose production was studied in the presence of toluene. Extensive protocols are given. The results in general show a const. decrease in maltose formation with increase in NaF content of the digesting mixts., while the glucose formation relative to the NaF-free control test (and absolutely) mounts almost parallel with the decrease in maltose production. The opposite phenomena also occurred under conditions of marked inhibition of activity by large doses of NaF though no definite relation between the factors could be established; and the indifferent behavior of the enzyme towards NaF in relation to maltose-splitting in comparison with its behavior as to its diastatic activity as a whole on starch, lead to the conclusion that there exists a certain balanced relation between the amylase and maltase activities with regard to the activity of the diastase as a whole, which notwithstanding the undoubted specificity of the individual enzymes, is yet so restricted that within certain limits the retardation of the one enzyme acts as a favoring factor for the other.

F. S. HAMMETT

**Light absorption by reduced hemoglobin.** P. HART. *Biochem. Z.* 115, 52-62(1921);

cf. C. A. 14, 949, 2646.—This paper is a report of a study of the light absorption by hemoglobin which has been reduced either with  $\text{Na}_2\text{S}_2\text{O}_4$  or by allowing the blood to putrefy. Where  $\text{Na}_2\text{S}_2\text{O}_4$  was used as the reducing agent pure hemoglobin was employed for testing. The absorption ratio of reduced hemoglobin at  $555.6\text{--}556.1\ \mu$  was found to be 0.001329, at  $541.4\text{--}533.7\ \mu$  to be 0.001891, the quotient of which is 0.785. The max. of the light absorption occurs at  $555.3\ \mu$ . All of these values differ from Hüfner's (cf. *Arch. Anat. Physiol.* 1894, 138). F. S. HAMMETT.

The relation between pressure, temperature and enzyme activity. I. The effect of pressure on the velocity of enzyme hydrolysis by pepsin, trypsin and diastase. S. FRÄNKEL and G. MEIDOLESI. *Biochem. Z.* 115, 85–95(1921).—The effect of normal, 5, and 10 atmospheres pressure on the digestive activity of pepsin on blood albumin was detd. The results indicate that a pressure of 5 atmospheres is an optimum for the reaction as carried out, although at 10 atmospheres digestion proceeds at a greater velocity than at normal levels. Trypsin showed a marked increase in activity at 5 atmospheres over that present at the normal. The results with diastase digestion of arrow-root starch were similar to those obtained for pepsin. F. S. HAMMETT.

Taste stimulating value of some homologous and isomeric compounds. Y. RENQVIST. *Skand. Arch. Physiol.* 40, 117–24(1920).—In this study R. used 6 different alkyl esters of cyanoacetic acid, the methyl and diethyl esters of oxalic, malonic, and succinic acids, the homologous alcs. of the  $\text{CH}_2$  series from  $\text{CH}_3\text{OH}$  to  $\text{C}_8\text{H}_{17}\text{OH}$ , and several isomeric esters of some ether acids, and tested their differential effect on the sense of taste. In general it can be stated that with increasing mol. wt. there occurs a decreasing taste stimulating effect, while the variations with isomers are irregular. F. S. HAMMETT.

Adsorption of alkali chlorides by animal charcoal. H. HARTLEBEN. *Biochem. Z.* 115, 46–51(1921).—A systematic study is reported of the adsorption by animal charcoal of Cl, NaCl, KCl, RbCl, and CsCl in 3 different concns. each. The results show that all these substances are adsorbed under the exptl. conditions to the same degree, thus tending to cast some doubt on the validity of the hypothesis that the permeability of the red blood-corpuscles as influenced by the alkali cations is detd. by the relative at. wts. of the cations used. F. S. HAMMETT.

The proteins of yeast. I. Preparation. PIERRE THOMAS. *Ann. inst. Pasteur* 35, 43–95(1921).—Two proteins are obtained on aq. extn. of yeast, the yield being greatest if the extn. is carried out at  $35^\circ$  in feebly alk. medium. One is a phosphoprotein, the other a true albumin, three parts of the latter to one of the former being present. The phosphoprotein, *zymocasein*, is insol. in water, sol. in alkali, and contains 16.15% N and 1.8% P. It is coagulated by rennet. The albumin, *cerevisin*, is sol. in water and coagulates in stages between  $41^\circ$  and  $70^\circ$ . It contains 16.35% N and 0.9% S. On hydrolysis the *zymocasein* of yeast is found to resemble milk casein in N partition and content of histidine, arginine and lysine. The N partition is as follows:  $\text{NH}_3$  N 6.86%, humic N 4.02%, diamino or basic N 26.67%, and monoamino N 60.39%. From the basic N fraction the following amino acids were recovered: histidine 2.63%, arginine 3.58%, lysine 4.09%. The tryptophan content was 1.51%. The albumin resembles that of peas, differing, however, in its lower content in arginine and marked richness in lysine, 8.1%, the highest figure for lysine recorded. Other results of analysis are as follows:  $\text{NH}_3$  N 5.89%, humic N 1.69%, diamino or basic N 23.68%, and monoamino N 67.03%, histidine 2.02%, and arginine 4.42%. The tryptophan content was likewise the highest recorded, 2.28%. Because of its high tryptophan and lysine content *cerevisin* is a valuable nutrient. A dog was kept in N equilibrium 6 days with *cerevisin* as the sole source of N. E. R. LONG.

Influence of certain organic bases and of their hydrochlorides on the activity of pancreatic amylase. A. DESGOREZ and R. MOOG. *Compt. rend.* 172, 551–3(1921).—

$\text{MeNH}_4$ ,  $\text{Me}_2\text{N}$  and  $\text{Et}_3\text{N}$  hydrochlorides exert a favorable influence on the action of pancreatic amylase, but the free bases, on the contrary, restrain the diastatic action. Free HCl does not appear to be the favoring factor, for if a starch paste is rendered aseptic with NaF and treated with pancreatin and 1 or 2 cc. 0.1 N HCl is added the diastatic action is retarded.

L. W. RIGGS

Displacement of the precipitation optimum of serum albumin by alkaloids, dyes, and other organic electrolytes, and the action of nonelectrolytes. RICHARD LABES. *Arch. ges. Physiol.* 186, 93-111(1921).—The effect of various substances upon the pptn. of serum albumin was 2-fold: (1) a displacement of the pptn. optimum, and (2) an inhibition or activation of the pptn. These actions are exerted by org. salts in the form of chlorides just as by inorg. salts. Displacement toward the less acid side increases with the cations in the series choline, physostigmine, morphine, pilocarpine, cocaine, quinine, optochin, and eucupinotoxin. Displacement toward the acid side increases with the anions in the series resorcinol, phenol, thymol, naphthol, salicylic acid, eosin, diamine red. All of the anions investigated increase the pptn. more or less; inhibiting anions, as the sulfate ion, are not found among the org. anions. Nonelectrolytes (ethyl, methyl, and heptyl alc., ether) never cause a displacement but only a broadening of the pptn. zone. Their effect strikingly parallels their surface activity.

G. H. S.

Relation between the salting-out and precipitation-inhibiting action of inorganic ions on protein solutions. RICHARD LABES. *Arch. ges. Physiol.* 186, 112-25(1921).—Inorg. ions influence the pptn. optimum of serum albumin. With increasing concns. of an neutral alkali salt the pptn. is displaced more and more into the region of higher acidity, up to the zone of the salting-out optimum. The neutral salts in extreme acid reactions salt out the best and the displacement of the pptn. optimum by the stronger absorbable anions of the neutral alkali salts is to be found on the acid side. G. H. S.

BANDLER, SAMUEL W.: The Endocrines. Philadelphia: W. B. Saunders Co. 486 pp. \$7 net. For review see *J. Am. Med. Assoc.* 76, 1268(1921).

ROBERTSON, T. B.: The Physical Chemistry of the Proteins. New ed. rewritten. London: Longmans, Green and Co. 438 pp. For review see *J. chim. phys.* 18, 447 (1920).

## B—METHODS and APPARATUS

STANLEY R. BENEDICT

The treatment of acid and alkali burns. A. K. SMITH. *Chem. Met. Eng.* 24, 748-9 (1921).—Promptly drown the burning agent with water, a shower bath being preferable before removing clothing. Before arrival of a physician apply satd. soln. of  $\text{NaHCO}_3$  for acid burns, and 2% AcOH for alkali burns.

JEROME ALEXANDER

Colorimetric determination of the hydrogen-ion concentration of the urine. W. BIEHLER. *Z. physiol. Chem.* 110, 288-306(1920).—Methyl orange, methyl red and neutral red were used as indicators. A simple colorimeter is described.

H. V. ATKINSON

The analysis of aqueous solutions with the refractometer. MAX DE CRINIS. *Z. physiol. Chem.* 110, 254-65(1920).—There is a direct linear proportionality between the concns. of salt solns. and their refractions. The index of the refraction of a mixt. of equal parts of different salt solns. is equal to the sum of the indices of the individual solns. A formula is given for the detn. of the ion concn. of salts in aq. soln. The method was found to be accurate on solns. from 1 to 10%.

H. V. ATKINSON

The determination of inorganic phosphate by alkalimetric titration. CYRUS H. FISKE. Harvard Med. School. *J. Biol. Chem.* 46, 285-95(1921).—The method depends upon the pptn. of  $\text{PO}_4$  as  $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$  in the presence of sufficient citrate to prevent pptn. of Ca and titration of the ppt. with 0.1 N HCl and NaOH. Dil. a vol. of urine

containing 2-7 mg. inorganic P in a 20X200 mm. test tube to approx. 10 cc. Add 1 cc. Mg citrate soln. (to 80 g. citric acid in 100 cc. hot H<sub>2</sub>O add 4 g. MgO, stir until dissolved, cool, add 100 cc. NH<sub>4</sub>OH (sp. gr. 0.90) and dil. to 300 cc.; filter after 24 hrs.) and 2 cc. NH<sub>4</sub>OH (sp. gr. 0.90). Shake gently until crystn. begins, then gently but continuously for 15 min. longer. Filter, with gentle suction, on a paper pulp filter in a glass tube, 120 mm. long, 8 mm. in diam. at the top, which is flanged and with a bore of 2 mm. at bottom, and wash with 10 cc. 2.5% NH<sub>4</sub>OH and then with four 5-cc. portions EtOH (distd. from alk.). The filtrate is received in a large test tube in the flask and is washed out between the 2nd and 3rd washings with EtOH. Add 0.1 N HCl to the pptn. tube until the ppt. has dissolved and pour it through the filtration tube, which is now supported in the mouth of a 100 cc. Erlenmeyer flask, poking the paper through with a nichrome wire, and rinsing the tube with 2 cc. 0.004% methyl red in 50% EtOH and 13 cc. H<sub>2</sub>O. Add 0.1 N HCl until 0.5-1.0 cc. in excess of that required to produce a distinct red color is present. Pour mixt. from flask to pptn. tube and back again and finally rinse out tube with 5 cc. H<sub>2</sub>O. Titrate with 0.1 N NaOH until a drop (0.01 cc.) makes the liquid distinctly yellower than the standard. This is prepared from 2 cc. of a mixt. of 50 cc. 2 N HOAc and 35 cc. 2 N NaOH dild. to 100 cc., 2 cc. of the methyl red soln. and 21 cc. H<sub>2</sub>O. 1 cc. 0.1 N HCl=1.552 mg. P. Good results are reported for KH<sub>2</sub>PO<sub>4</sub> solns. and for the Mg ppts. from urine, as compared with the Lorenz method (weighing as NH<sub>4</sub> phosphomolybdate).

I. GREENWALD

A colorimetric method for determining the hydrogen-ion concentration of small amounts of fluid. LLOYD D. FELTON. Johns Hopkins Med. School. *J. Biol. Chem.* **46**, 299-305(1921).—Using the solns. of Clark and Lubs, H-ion detns. may be made with single drops, if examined on a white porcelain plate. Combinations of indicators may be used over a wide range; thymol blue and bromophenol blue between  $P_H$  1.2 and 4.6; methyl red and brom-thymol blue from  $P_H$  4.6 to 7.8; methyl red and bromocresol purple from  $P_H$  4.6 to 7; and for a rough "feeler", methyl red and thymol blue from  $P_H$  4.6 to 9.

I. GREENWALD

A note on the modification of the Van Slyke method of protein analysis. PAUL MGNANT. Oklahoma Agr. Expt. Sta., Stillwater. *J. Biol. Chem.* **46**, 351-3(1921).—In analyzing protein of pecan, it was found that pptn. of humin with CaO (cf. Van Slyke, *C. A.* **6**, 236) was incomplete. M. hydrolyzes 3 g. protein in 150 cc. 10% HCl or H<sub>2</sub>SO<sub>4</sub> and adds 15 g. phosphotungstic acid (HPW). After several hours cooling, again heat to boiling, filter off phosphotungstates of NH<sub>4</sub> and humin and wash with 50 cc. hot 10% acid. To ppt. add 5-10 g. HPW and proceed in usual manner. From 1 to 2 mg. NH<sub>4</sub>-N remains in filtrate. The insol residue is made alk. and distd. for detn. of NH<sub>3</sub>. Humin N may be detd. in residue but is best detd. in an aliquot of the hydrolyzate by adding 10% Na<sub>2</sub>WO<sub>4</sub> to the hot soln. until the humin is pptd. and the supernatant liquid is clear. 2 g. protein require from 2.5 to 10 g. Na<sub>2</sub>WO<sub>4</sub>. The ppt. is filtered off, washed with 10% acid and used for Kjeldahl. Analyses of gliadin agree with published data. Cf. Van Slyke (*C. A.* **6**, 236) and Osborne, Van Slyke, Leavenworth and Vinograd (*C. A.* **9**, 3073).

I. GREENWALD

A clinical method for the quantitative determination of potassium in small amounts of serum. BENJAMIN KRAMER AND FREDERICK F. TISDALL. Johns Hopkins Hosp. *J. Biol. Chem.* **46**, 339-49(1921); cf. *C. A.* **14**, 951.—K is pptd. as K<sub>2</sub>NaCo(NO<sub>2</sub>)<sub>6</sub> without previous ashing and is then titrated with KMnO<sub>4</sub>. To 1 cc. serum in 15 cc. centrifuge tube add, drop by drop and with constant mixing, 2 cc. of reagent prepared by adding 210 cc. of soln. of 120 g. NaNO<sub>2</sub> in 180 cc. H<sub>2</sub>O to soln. of 25 g. Co(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O in 50 cc. H<sub>2</sub>O and 12.5 cc. HOAc. After 45 min., add 2 cc. H<sub>2</sub>O, mix and centrifuge at 1300 to 1400 revolutions per min. for 30 min. With a syphon, the lower end of which is curved upwards, remove all but 0.3 cc. of the supernatant liquid. Run 5 cc. 6-H<sub>2</sub>O down the side of the tube and agitate gently so as not to disturb the ppt. too much,

yet wash it thoroughly. Centrifuge 5 min. and repeat washing 3 times. The liquid from the fourth washing should be colorless. Add excess of 0.02 *N*  $\text{KMnO}_4$  (2 cc. are generally sufficient), then add 1 cc. 4 *N*  $\text{H}_2\text{SO}_4$  and mix ppt. with liquid with glass rod. Heat in boiling  $\text{H}_2\text{O}$ -bath to no further change in color (1.5 min.). Add excess (generally 2 cc.) 0.01 *N* Na oxalate and finally titrate with 0.02 *N*  $\text{KMnO}_4$ . Multiply cc.  $\text{KMnO}_4$  used in all by 2, subtract cc. Na oxalate and multiply by 7.1 to get mg. K per 100 cc. serum. Results are accurate to within  $\pm 5\%$ . In normal sera of adults or children, the K content varies between 18 and 21 mg. per 100 cc. In a number of pathological conditions in children this may be increased to as much as 70 mg. I. GREENWALD

Some recent methods for testing for occult blood: Studies on oxidizing enzymes of plants. I. BOAS. *Arch. Verdauungs-krankh.* 27, 37-63 (1921); cf. C. A. 14, 3435.—An extended review of the various methods for the detection of occult blood, the aim of which is to show that the spectroscopic method is by far the best and most reliable. The differential studies of hematin and plant oxidases show that the former is much more resistant to high temps., mineral acids, and the digestive action of the alimentary tract; hence it is not probable that such oxidases play any significant role in the test for occult blood in the feces. F. S. HAMMETT

The question of occult blood in the stools. J. KOOPMAN. *Arch. Verdauungs-krankh.* 27, 123-27 (1921).—A review of the literature and discussion of the various methods of detection of occult blood in feces, together with a tabulation of comparative results which gives the impression that the benzidine reaction is the most delicate, though interfering materials may enhance the effect. F. S. HAMMETT

The use of Barcroft's differential apparatus. R. WERTHEIMER. *Biochem. Z.* 106, 1-11 (1920).—A description of the method and results of W. in calibrating a series of Barcroft's app. for differential blood analysis. Cf. C. A. 5, 3538; 7, 2687. F. S. HAMMETT

Colorimetric phenol determination in urine. M. WHISS. *Biochem. Z.* 110, 258-65 (1920).—The method outlined is based on the Millon reaction. Urine which has been previously freed from protein—if such be present—by  $\text{Ba}(\text{OH})_2$  soln. is dild. 2 to 5 times with distd.  $\text{H}_2\text{O}$  and 3 cc. are transferred to a small graduated glass tube and 2 cc. of a 5%  $\text{HgSO}_4$  soln. in 5 vol. %  $\text{H}_2\text{SO}_4$  are added. The tube is closed with a rubber stopper in which is inserted a small condenser and heat is applied from a spirit lamp for 15 min. As soon as the liquid has stopped boiling, 3 drops of 0.5%  $\text{NaNO}_3$  soln. are added; no attention is to be paid to the ensuing turbidity. After 3 min. in which the Millon reaction has reached its max. intensity, the liquid is filtered clear and compared with a standard 1:50,000 tyrosine soln. If the unknown is twice or half as strong as the standard the measurements are sufficiently accurate; beyond these limits stronger or weaker standards must be made up. By this method it was found that pathological conditions which particularly affect the digestive tract give rise to an increased phenol excretion. Cf. Folin and Denis, C. A. 9, 3283, 3272. F. S. HAMMETT

Method for the determination of chlorides in small amounts of fluid. S. RUBENYAK. *Biochem. Z.* 114, 23-6 (1921).—R. adapts Korányi's method for Cl (cf. Z. klin. Med. 33) to microchem. procedure. 0.11 to 0.13 cc. of the liquid to be analyzed is measured with an accurately graduated capillary pipet into a 15 cc. flask and the pipet is rinsed with 1 to 2 cc. distd.  $\text{H}_2\text{O}$ . 1.80 cc. of 0.01 *N*  $\text{AgNO}_3$  is measured into the flask when blood or serum is to be analyzed, more for urine, and 10 drops of Cl-free concd.  $\text{HNO}_3$  are added and the whole is carefully warmed. During the heating a concd. soln. of  $\text{KMnO}_4$  is added drop by drop until the color fails to disappear. Three to 4 drops are usually sufficient for serum. Heating is continued for about 5 mins. and then a trace of dextrose is added to decolorize the soln. The  $\text{AgCl}$  settles out in lumps, leaving a water-clear colorless soln. above. The excess of  $\text{AgNO}_3$  is titrated with a 0.01 *N*  $\text{NH}_4\text{CNS}$  soln. using 4 to 5 drops of concd.  $\text{Fe NH}_4$  alum as indicator. The amt. of chloride is

given by the formula  $\left( \frac{(\text{cc. AgNO}_3 - \text{cc. NH}_4\text{CNS})}{\text{amt. in capillary}} \right) 0.0585$ . Good agreement is obtained in duplicates and with Korányi's macro-method. F. S. HAMMETT

**A color reaction of glycine anhydride and dipeptide anhydrides containing a glycol component.** T. SASAKI. *Biochem. Z.* 114, 63-6(1921).—S. found that glycine anhydride, *dl*-alanine anhydride, *dl*-leucylglycine anhydride, and glycol-*l*-tyrosine anhydride give the Jaffé reaction with picric acid and alkali as does creatinine, although to a lesser degree and when  $\text{Na}_2\text{CO}_3$  is used instead of  $\text{NaOH}$ . Since sugars also react it is evident that the presence of a N atom is not essential; consequently S. considers that a labile H is the important factor, though at present he is unable exactly to place the construction on which the color development depends. A list is given of some 37 compds. which respond to the test. F. S. HAMMETT

**Method of phosphoric acid determination: Application of Pregl's procedure to serum analysis.** STELLA WIENER. *Biochem. Z.* 115, 42-5(1921).—W. ppts. 10 cc. of serum with 90 cc. of a mixt. of 0.5% picric acid in 1% acetic acid. Forty cc. of the deproteinized filtrate are ashed to yellow color in a 100-cc. Kjeldahl flask with 1 cc. concd.  $\text{H}_2\text{SO}_4$ ; the yellow residue is oxidized with 2 or 3 applications of concd.  $\text{HNO}_3$ , or until no coloration on diln. appears, due to undecompd. picric acid. Two cc. of  $\text{HNO}_3$  (357 cc. acid (d. 1.4) + 500 cc.  $\text{H}_2\text{O}$ ) are then added and the soln. is made to about 15 cc., brought to a boil and pptd. with 15 cc. of the sulfate molybdenum reagent. The lipid P is detd. in the picric-acetic acid ppt., which is washed with picric acid, ashed with 3 to 4 cc.  $\text{H}_2\text{SO}_4$ , the ash neutralized with  $\text{K}_2\text{CO}_3$  and then treated as usual. More convenient is the detn. of the P content of the total serum and then of the protein-free portion, from which the lipid fraction is obtained by difference. In the total P detn. 2 cc. of serum are ashed with 1 cc. concd.  $\text{H}_2\text{SO}_4$  and treated as is the protein-free filtrate. F. S. HAMMETT

**Amino nitrogen in the urine by the formol method.** C. CIACCIO. Univ. Messina. *Arch. sci. med.* 43, 177-81(1920).—By a comparison of results by the Henriquez method and those obtained by a preliminary treatment of the sample with  $\text{Hg}(\text{OAc})_2$  or tannin and  $\text{Pb}(\text{OAc})_2$ , figures being given both before and after hydrolysis with  $\text{HCl}$ , the conclusion is reached that the amino N by the formol method in urine is not present in the form of simple amino acids, but as more or less complex polypeptides. The discordant results obtained by various workers are thus explained, since polypeptides are partially pptd. by salts of heavy metals or by phosphotungstic acid. It is believed that the most useful information would be obtained by applying the formol method (1) after hydrolysis of the urine without any preliminary treatment; (2) after treatment with tannin and  $\text{Pb}(\text{OAc})_2$  or with  $\text{Hg}(\text{OAc})_2$ ; (3) after hydrolysis of the filtrate obtained by pptn. with these substances. In this way the elimination of the more or less complex protein fragments could be studied in various pathological conditions. M. HEIDELBERGER

**Tests for changes in the protein content of the cerebrospinal fluid.** HIDEYU NOGUCHI. *J. Am. Med. Assoc.* 76, 632-3(1921).—The method is based on the flocculation of lipoids. A stock of "Solution 1" is prepd. as follows: Beef heart is put through a sausage machine and then completely dried by a fan over a heater. One hundred g. of the dried substance are extd. with 1000 cc. acetone for 5 days at room temp. with daily shakings, the acetone is discarded and the solids, freed from acetone by evapn., are extd. 5 days with 1000 cc. abs. alc. at room temp. The yellow alc. ext., which contains acetone-insol. tissue lipoids, is sepd. from the solids and tested for suitability by mixing a sample with "Solution 2" in the ratio of 1:9. If no marked opalescence occurs Soln. 1 is suitable. A stock of "Solution 2" is prepd. as follows: Four g.  $\text{NaCl}$  and 1.5 g.  $\text{KH}_2\text{PO}_4$  are dissolved in 990 cc.  $\text{H}_2\text{O}$  containing 0.5 cc. glacial  $\text{AcOH}$ , and 10 cc. of satd. soln. of picric acid in abs. alc. are added. If the soln. is not to be kept in the refrigerator it is best

to make it 10 times the strength, that is, the amts. named in 90 cc.  $H_2O$ . At the time of use 1 part of this concd. soln. is dild. with 8 of  $H_2O$  and 1 part of the lipoidal soln. added. To make a test, add gradually with mixing 1 part of Soln. 1 to 9 parts Soln. 2 (if Soln. 2 is poured into Soln. 1 the test is spoiled). Place 0.1 cc. cerebrospinal fluid in a 10×1 cm. test tube, and add 1 cc. of the solns. mixed as above directed—a normal spinal fluid remains clear or faintly opalescent while a dense general turbidity is produced in all specimens containing an increased amt. of globulin or albumin. With bacterial meningitis or general paresis a dense flocculation occurs. The max. opacity is reached in a few min. at temps. ranging from that of icebox to incubator. A mild reaction is indicated by a slight general turbidity, best seen by reflected light. L. W. RIGGS

Specific precipitation for Bence-Jones protein. LUDVIG HEXTON *J. Am. Med. Assoc.* 76, 929-30(1921); cf. Walters, C. A. 15, 1353.—Rabbits were "injected intravenously every 4 or 5 days 4 or 5 times with increasing quantities of urine containing Bence-Jones protein. The amts. injected were 2, 4, 8, 12 and 16 or 20 cc. as a rule and the animals were bled on the 7th or 8th day after the last injection, because at that time the antibody content of the serum reached its highest point." "The serum of rabbits injected as described may contain a sp. precipitin or precipitins that cause ppts. in urine or blood serum containing Bence-Jones protein." Special methods of manipulation are given with a promise of further details to be published later. L. W. RIGGS

Basal metabolism determinations with the original portable Benedict apparatus. G. W. McCASKRY. *J. Am. Med. Assoc.* 76, 978-82(1921).—McC. gives a general review of the subject and a discussion of methods. The value of the detns. is confirmed by additional experience. Crude and inaccurate methods may be foisted on the medical profession by com. "enterprise" and must be guarded against. The accuracy of the Benedict app. has been proved by ample tests, and the criticisms relative to the use of this app. are considered to be without adequate foundation. A new and simplified method of calcn., making the use of logarithms optional, is given. (Cf. Tihen, C. A., 15, 1033.) L. W. RIGGS

Differential analysis of acetone, acetaldehyde, and formaldehyde in organic liquids (PITTARELLI) 7.

KRAFT, ERNST: *Analytisches Diagnostikum. Die chemischen, mikroskopischen und bakteriologischen Untersuchungsmethoden von Harn, Auswurf, Magensaft, Blut, Kot, u. s. w.* 3rd Ed. Leipzig: Barth. 480 pp. M. 84, bound M. 70. For review see *Chem. Weekblad* 18, 235(1921).

## C—BACTERIOLOGY

A. K. BALLS

Further observations on the eosin-methylene blue agar. MAX LEVINE. *J. Am. Water-Works Assoc.* 8, 151-56(1921); cf. C. A. 15, 1151.—As a result of more recent work it is shown that this reagent is a simple and reliable medium for the detection of *B. coli*. At the same time it differentiates between these sewage forms and the less harmful *B. aerogenes*. D. K. FRENCH

The influence of selenium on the development of mold spores from *Penicillium*. A. NĚMEC AND V. KAS. *Biochem. Z.* 114, 12-22(1921).—Studies are reported of the effect of concns. of  $Na_2SeO_4$  ranging from  $1 \times 10^{-3}$  to  $1 \times 10^{-4}$  g. on the development of spores of *Penicillium Roqueforti* and *P. candidum* in a culture medium made of 1000 cc. distd.  $H_2O$ , 46.6 g. lactose, 2.66 g. lactic acid, 0.4 g.  $K_2CO_3$ , 2.66 g.  $NH_4NO_3$ , 0.4 g.  $(NH_4)_2PO_4$ , 0.153 g.  $(NH_4)_2SO_4$ , 0.71 g.  $MgSO_4$ , 0.081 g.  $ZnSO_4$ , and 0.081 g.  $MnCO_3$ . The dry wt., ash, and  $P_2O_5$  of dry wt. and ash were used as measures of the effect of the added  $Na_2SeO_4$ . It was found that extremely small amts. of the compd. increased spore development of both types, even in the presence of Zn and Mn, although *P. candidum* appeared to be more sensitive to the stimulating influence. The mineral metabolism



of the molds is influenced by Se, as evidenced by the higher ash content accompanying the lower doses. When amts. of Se were present sufficient to exert a toxic effect, then the ash decreased. The  $P_2O_5$  of the ash was decreased by the addition of Se in non-toxic doses and increased when the toxic effect was produced. F. S. HAMMETT

**The formation of *p*-hydroxyphenylacetic acid and *p*-hydroxyphenylacrylic acid from *l*-tyrosine by bacteria.** K. HIRAI. *Biochem. Z.* 114, 71-80(1921).—H. used a strain of *Proteus vulgaris* obtained from putrefying pancreas. Five agar cultures of the organism were put in 5 sep. flasks contg. 800 cc. of sterile Ringer soln. in which 2 g. of *l*-tyrosine were suspended, and the whole was incubated for 40 days at 37°. On the 8th day the tyrosine had gone into soln. At the end of the period of incubation, the bacterial purity of the digest was detd. and the contents of the 5 flasks were combined and evapd. on the water-bath after acidification with HCl. The residue was extd. with hot alc. until the filtrate no longer gave a positive Millon reaction. The alc. ext. was evapd., taken up with a small amt. of alc. dild. with much  $H_2O$  and extd. for 20 hrs. with acidulated  $Et_2O$ . The solvent was distd. from the  $Et_2O$  ext. after the  $H_2O$  had been absorbed by dry  $Na_2SO_4$ . The residue crystd. out on standing in the ice-box. This was recrystd. from hot  $H_2O$  and decolorized with animal charcoal. The product had a m. p. of 143 to 149°, gave a positive Millon reaction and on analysis was shown to be *p*-hydroxyphenylacetic acid. When the digestion was stopped at 12 days a similar procedure gave *p*-hydroxyphenylacrylic acid. Other less satisfactory results were obtained when an attempt was made to demonstrate the production of *p*-hydroxyphenylacetic acid from *l*-tyrosine by *Proteus vulgaris* in a special digestion mixt. containing glycerol. F. S. HAMMETT

**The influence of different metallic salts on the formation of bacterial products from amino acids.** I. OTSUKA. *Biochem. Z.* 114, 81-7(1921).—The action was studied of  $FeSO_4$ , of Ni, Co, Mn, Cr, U, Sn, Pb, Bi, Ag, Cu, Zn and Al phosphates and of basic Hg phosphate on the ability of *Bacillus proteus* to form compds. from tyrosine in nutrient media containing Henderson's phosphate mixt., and in media plus lactose but without the phosphate mixt. In the former mixt. when Cu and basic Hg phosphates were present no *d,p*-hydroxyphenyllactic acid was formed though the tyrosine had disappeared. On the other hand when  $FeSO_4$  and U and Al phosphates were added this compd. was produced in determinable amts. In the latter mixt. no particularly good effect was observed as due to the presence of the metals. With the basic Hg phosphate, *p*-hydroxyphenylacetic acid was produced. F. S. HAMMETT

**Agglutination and sedimentation of bacteria.** JOSEPH VORSCHÜTZ. *Arch. ges. Physiol.* 186, 290-8(1921).—Saline suspensions of 10 different organisms of the enteric group—*B. Gärtner*, *B. Breslau*, *B. typhosus*, *B. paratyphosus A* and *B. coli*, *V. cholerae*, *B. Flexneri*, *B. Shigae*, and *B. dysenteriae-Y*—were tested for agglutinability by the sera of 39 pregnant women (7th, 8th, and 9th months). Eighteen of the sera gave positive reactions (agglutination in the 1:100 diln.) with cholera, coli, Flexner, and Y strains, and with the other organisms to a less degree. With normal sera, male and female, only negative results were secured. The same bacterial emulsions were tested with sera from the cow, goat, and horse, and it was found that with these sera also only the cholera, coli, Flexner and Y strains were agglutinated, just as the blood corpuscles of these animals when tested in cross agglutination show the cells of the cow and goat to be as inagglutinable as the 6 refractory bacterial strains. When tested with varying concns. of histone sulfate all strains were agglutinated, hut to varying degrees, the order of susceptibility being cholera > coli > Y > Flexner, Shiga, typhoid > para A, para B, Gärtner, Breslau. With lanthanum nitrate all strains were agglutinated hut in varying dilns.; thus cholera still agglutinated in M/2000, Gärtner and Breslau in M/200 and the other 7 in about M/1000. Gelatin acted upon bacterial cells as regards sedimentation as it does upon red blood cells. Bacteria group themselves as regards ag-

glutinability and susceptibility to sedimentation as do the red cells of various animal species, and the substance in pregnant sera which induces sedimentation of blood cells also causes the agglutination of bacteria. Shaking such sera with kaolin, or the addition of narcotics, inhibits both reactions. G. H. S.

The flora of deteriorating sugar (AMONS) 28. The detrimental effect of beet saponin on alcoholic fermentation (ŠATAVA) 16.

GÉRARD, ERN.: *Tecniqne de sterilisation*. 3rd Ed. revized and enlarged. Paris: Vigot frères. 10 fr. For review see *Bull. chim. farm.* 60, 108(1921).

#### D—BOTANY

CARL L. ALSBERG

Effect of light on germination of light-sensitive seeds. W. A. GARDNER. *Bot. Gas.* 71, 249–88(1921).—The seeds of *Rumex crispus*, *Datura stramonium* and *Phoradendron flavescens* were found to be light-sensitive. The germination of seeds of *Rumex crispus* and *Phoradendron flavescens* promoted, and that of *Datura Stramonium* was hindered by light. B. H.

The weight of the beet root from the cultivation standpoint. PLABN-APPIANI. *Central. Zuckerind.* 405, 1919; *Z. Zuckerind. techoslov. Rep.* 44, 92(1919).—The author deals only with the relationship of the weight of the beet root to the sugar content. He does not discuss its possible economical importance and comes to the conclusion that heavy beets will only become of prime importance in selection if the increase in weight will mean a corresponding increase in sugar content. Beets, which are heavier only because of their ability to receive more water, should be classified as beets richer in water content. JOHN M. KRNO

The relationship between the size of the beet seed and the yield of beets obtained from them. JOSEF URBAN. *Listy Cukrovar* 38, 121–4(1920); *Z. Zuckerind. techoslov. Rep.* 44, 151–5(1920).—Large seeds compared with small sized seeds from the same harvest show a higher yield of beets. No relation can be assumed between the size of the seed and the corresponding sugar content of the beet grown from it, since beets of high sugar content are often developed from small seeds. The size of the seed, however, is an important factor in the improvement of the beet quality. JOHN M. KRNO

The action of alkaloids on *Botrytis cinerea*. PIERRE NOBÉCOURT. *Compt. rend.* 172, 706–8(1921).—The hypothesis has been advanced that alkaloids may protect plants against the attacks of parasitic fungi. To test this hypothesis *Botrytis cinerea* was grown in Raulin's soln. to which different amts. of alkaloids studied were added. Nicotine up to a concn. of 2.5%, and atropine sulfate up to 2.0% did not retard the growth of the fungus. Conidiophores were produced abundantly in concns. of 1.0% or below of quinine sulfate, sclerotia below 0.4%. Growth was very slight at 2.0% and none occurred at 3.0%. In 0.2% aconite growth was reduced visibly, considerably at 0.4%, and at 1.0% very little growth occurred. There was no germination in a concn. of 2.0%. Aconite seems to be the only alkaloid used which might occur in a plant in sufficient concn. to serve as a protection against this fungus. A sterile race of *B. cinerea* was somewhat less resistant to alkaloids. T. G. PHILLIPS

Variations in organic acids during the formation of anthocyanin pigments. DENNIS KOHLER. *Compt. rend.* 172, 709–11(1921).—Free and combined org. acids were detd. at intervals during the formation of pigments in the corolla of *Cobaea scandens*, the leaves of *Ampelopsis tricuspidata* and the stems of *Polygonum fagopyrum*. Increases in org. acids were noted in some cases, decreases in others. T. G. PHILLIPS

Effect of salt solutions having definite osmotic concentrations upon absorption by seeds. W. RUDOLFS. *Soil Sci.* 11, 277–93(1921).—A study of the influence of salt solns. at varying osmotic concns. upon H<sub>2</sub>O absorption by seeds of different species was made. Single salt solns. varying from 0.001 to 7.0 atms. of Ca(NO<sub>3</sub>)<sub>2</sub>, K<sub>2</sub>CO<sub>3</sub>,

MgSO<sub>4</sub>, KH<sub>2</sub>PO<sub>4</sub>, NaCl, KCl, and NaNO<sub>3</sub> were used with seeds of wheat, corn, watermelon, buckwheat, Canada field pea, white lupine, soy beans, rape, and alfalfa. There is a marked difference in the absorbing power of seeds of different species. The highest absorption rates are indicated for alfalfa, the lowest for corn. Av. absorption rates show a linear relation to the osmotic concn. of the solns., decreasing with increase in concn. except in dil. solns. Low concns. have a stimulating influence upon the absorption rate of some seeds but not upon the rates of others. W. J. ROBBINS.

The chemical composition and the yield of green corn cut at different periods. STEPHAN WEISER AND ARTHUR ZAITSCHEK. *Landw. Vers.-Sta.* 97, 111-30(1920).—Analyses of the fresh material from several stations are recorded in tables which show the amts. of digestible foodstuffs present at different stages in the growing period. Another set of tables shows the yields (as dry wt., ash, crude protein, etc.) per square unit of surface. F. M. SCHERTZ.

Senecio disease in South Africa. ANON. *Bull. Imp. Inst.* 18, 435-6(1920).—A disease caused by contamination of wheat is attributed to the fruits and other portions of the plants *Senecio ilicifolius* and *S. Burchellii*. No chem. examn. was reported but it is thought that the plants contain alkaloids similar to those of *S. latifolius*, which contains 1.2% alkaloids (senecifoline and senecifolidine) before flowering but only 0.44% after flowering (cf. C. A. 3, 1530). R. L. SHELLEY.

A preliminary note on the effect of watering on the amount of acid produced by the gram plant, *Cicer arietinum*. D. L. SAHASSARUDDH. *Agr. J. India* 15, 636-8 (1920).—Expts. made in pots show that the greater the amt. of water given the gram plant, the more acidity the plant produces. The acids produced are recognized as malic and oxalic. The parts of the plants having glandular hairs are the most acid. J. J. SKINNER.

Nitrogenous compounds in egg-plant (*Solanum melongena*, L.). KJYOHISA YOSHIMURA. *J. Chem. Soc. Japan* 42, 16-22(1921).—A discovery of imidazolyethylamine in fresh egg-plant is recorded. 60 kg. of the fresh ripe egg-plant were extd. 3 times with boiling H<sub>2</sub>O. The filtrate was treated by the customary method. From the phosphotungstic acid ppt. the following bases were isolated. 1.5 g. of trigonelline (as chloride), 0.2 g. of imidazolyethylamine (as a double Au salt), 1.0 g. of adenine (as chloride), and 2 g. of choline (as chloride). The sample contained 95.5% H<sub>2</sub>O, 4.5% of solid. 100 part of the solid contained 5.089 total N, 3.710 protein N, and 1.379 parts of non-protein N. S. T.

REINAU, E.: Kohlensäuredüngung und Pflanzen. Ein Beitrag zur Kohlensäuredüngung der Pflanzen und ein Versuch zu einer geophysischen Pflanzenphysiologie. Halle: Verlag Knapp.

## E—NUTRITION

PHILIP B. HAWK

### NORMAL

Formation of protein from urea by cattle. E. SALKOWSKI. Univ. Berlin. Z. physiol. Chem. 109, 276-9(1920).—Völtz's claim that sheep fed on sugar, starch and urea gained 15 g. protein per day is questioned because even straw treated with NaOH and fed to animals does not contain enough S to supply the S of the proteins formed on this diet; therefore K<sub>2</sub>SO<sub>4</sub> and K<sub>2</sub>S must be added. H. V. ATKINSON.

Basal metabolism. J. ROUILLARD. *Presse med.* 29, 205-7(1921).—A review of work done in America during the past 5 years. H. A. SHONLE.

The digestibility and assimilability of the nutritive materials of *Endomyces vernalis* Ludwig by carnivora and herbivora (ruminants). W. VÖLTZ, W. DIETRICH AND A. DEUTSCHLAND. *Biochem. Z.* 114, 111-23(1921).—The organism studied contains a large amt. of its substance as a fat which is very much like olive oil. When it is added

to the diet of dogs and sheep its digestibility and assimilability is expressed in the following table:

	Crude foodstuff.	Dog Digestion Coeff. %.	Digestible material.		
			Ruminant Digestion Coeff. %.	Kg.	
Dry substance	90.00	56.4	50.8	....	....
Ash	4.25	....	....	....	....
Org. matter	85.75	59.4	50.9	74.9	64.0
Crude protein	20.84	64.0	13.3	65.4	13.6
Crude fat	25.14	57.8	14.5	79.7	20.0
Carbohydrate	39.77	53.1	23.1	75.2	20.9
Calories	516900 Cal.	59.6	308200 Cal.	73.0	377500 Cal.
Assimilable	.....	49.6	256400 Cal.	65.4	333100 Cal.
Starch value	.....	....	....	....	90.9 kg.

When the cells of the organism are crushed before feeding there is a large increase in fat absorption (from 53 to 85%) but no increase in digestibility. The isolated fat of the *Endomyces* is about 87% absorbed.

F. S. HAMMETT

**Putrefaction products of polished rice.** KIVOHISA YOSHIMURAA AND KEN CHENFON. *J. Chem. Soc. Japan* 42, 22-37(1921).—Two kg. of the polished rice were putrefied in 4 l. of H<sub>2</sub>O for 10 days at 30-2°. The residue was filtered off and its acids were detd. Each 100 g. rice gave 0.6671 g. of volatile acid (as AcOH), and 0.608 g. of non-volatile acid (as lactic acid). The lactic acid was identified by its Zn salt. For detn. of the org. bases, two samples were used. I putrefied for 19 days, II for 33 days. From the arginine fraction were isolated imidazolylethylamine and a trace of putrescine; and from the lysine fraction, putrescine and a trace of amylamine. The total amt. of the bases actually obtained from I and II are: 0.8 g., 0.2 g. of imidazolylethylamine; 0.7 g., 2 g. of putrescine; trace, 1, of amylamine; and 55 g., 5.2 g. of NH<sub>3</sub>. The absence of cadaverine is significant, because the rice is known to contain a very small amt. of lysine. A chem. analysis of the rice used for the expts. is also given.

S. T.

#### ABNORMAL

**The calcium metabolism of premature infants.** B. HAMILTON. *Am. J. Diseases Children* 20, 316-322(1920).—The observations were made on 4 infants born 4 to 10 weeks before full term, receiving human milk from the bottle. Three infants had very low Ca retentions during the first months of life. The addition of CaCl<sub>2</sub> to the milk can increase the Ca retention. All of the cases developed craniotabes.

S. A.

**Studies in metabolism. II. The metabolism of a very obese child with a small sella turcica (typus Fröhlich).** F. B. TALBOT. *Am. J. Diseases Children* 20, 331-8 (1920).—The basal metabolism of the very obese boy, mentally dull, 33 months old and weighing 24.82 kg. was 631 cal., corresponding to that of normal boys of the same age. The total metabolism compared with boys of the same weight was 37% below the average. The heat production per kg. body wt., compared with that of normal boys of the same age, was 56% below the av. In comparison with that of normal boys of the same wt. it was 40% below the av. Per sq. meter body surface the metabolism was 41% below the normal for his age and 32% below the normal for his wt.

S. AMBERG

**Metabolism in pellagra. A study of the urine.** M. X. SULLIVAN, R. E. STANTON AND P. R. DAWSON. *Pellagra Hosp., U. S. Public Health Service, Spartansburg, S. C. Arch. Intern. Med.* 27, 387-405(1921).—Casts or albumin or both were found in about

50% of the cases but some cases of marked pellagra showed no evidence of kidney change. Metabolism expts. indicated poor protein absorption, with intestinal putrefaction. The % of total N as urea was low, that as  $\text{NH}_3$  and undetd. N was high. Creatinine content and coefficient were low. After a month on a remedial diet, there was a return to normal relations among the N constituents of the urine but the absorption of N remained poor for a longer time. The abnormalities in the urine were greater in the systemic type of pellagra than in the dermal type.

I. GREENWALD

A review of carbohydrate metabolism as related to diabetes. F. P. KNOWLTON.  
N. Y. Med. J. 113, 591-2(1921).—A review.

F. S. HAMMETT

## F—PHYSIOLOGY

ANDREW HUNTER

The harmful action of carbon dioxide on red blood corpuscles. W. PATSCHKE. Univ. Hamburg. Z. physiol. Chem. 109, 1-11(1920).—Expts. in glass show that the formation of methemoglobin is increased 50 times by satn. of blood with  $\text{CO}_2$  and that  $\text{O}_2$  inhibits this action.

H. V. ATKINSON

The microdetermination of dextrose according to Bang. B. OPPLER. Z. physiol. Chem. 109, 57-64(1920).—The ratio between the wt. of dextrose and the cc. of 0.01 N iodate soln. varies from 1:2.78 to 1.19 for quantities of dextrose varying from 0.545 to 0.027 mg. Bertrand's method is preferred for dextrose concns. under 1 mg.

H. V. ATKINSON

Formic acid in human blood. WILHELM STEPP. Z. physiol. Chem. 109, 99-107(1920).—None was found.

H. V. ATKINSON

Is selenium found in plant and animal organs? R. FRITSCH. Z. physiol. Chem. 109, 186-8(1920).—A discussion and bibliography.

H. V. ATKINSON

Physiology of the thyroid. VII. F. BLUM AND R. GRUTZNER. Z. physiol. Chem. 110, 277-37(1920).—The clear press juice of the thyroid was injected into different animals. The proteins introduced were quickly decompd., as judged by the appearance of I in the urine and iodides in the blood. In this respect normal and thyroidectomized animals reacted the same. In perfusion expts. and expts. *in vitro*, the liver was found to be the only organ which can decompose the I proteins of the thyroid. Three fractions of the products of decompn. were isolated.

H. V. ATKINSON

Studies of the blood of normal monkeys. E. B. KRUMBAHAR AND J. H. MUSSER. Univ. of Penna. J. Med. Res. 42, 105-9(1921).—Hemoglobin detns., blood counts and morphologic studies of the corpuscles of 13 healthy Rhesus monkeys are recorded.

E. B. FINK

The heat capacity of arterial and venous blood. E. ATZLER AND F. RICHTER. Biochem. Z. 112, 310-12(1920).—Detns. were made of the specific heat of beef blood in which arterial properties were induced by passing a stream of O through the liquid for some hrs. Blood similarly treated with H was taken as representing venous blood. After calcn. of the loss of  $\text{H}_2\text{O}$  resulting from the procedure by sp. gr. detns. before and after treatment the following values were obtained for the sp. heat of oxygenated blood, hydrogenated blood and fresh blood respectively: 0.9165, 0.9175, 0.9175, from which it is concluded that there is no difference between the heat capacity of arterial and venous blood. (Cf. C. A. 14, 2349.)

F. S. HAMMETT

New studies of the water economy of the frog. J. K. PARNAS. Biochem. Z. 114, 1-11(1921).—When hypertonic  $\text{Na}_2\text{SO}_4$  soln. is injected intravenously into the frog, fluid leaves the tissues and enters the blood as shown by the decreased cell count and f. p., and a condition of bydremic plethora is produced which lasts for an hr. or more. At the same time an increased flow of urine takes place, always of a lesser mol. concn. than found in the blood. If the frog is meanwhile placed in  $\text{H}_2\text{O}$  the injected salt is eliminated in a much larger amt. of very dil. urine, the dilg.  $\text{H}_2\text{O}$  first coming from the

tissues and then from epithelial inhibition. The frog kidney never excretes hypertonic urine. This leads to the opinion that this excretory app. is adapted for the strictest salt economy and thus is not an organ equiv. to the kidney of the warm-blooded animals, although the functional relation of tubules and glomeruli is similar in both groups.

F. S. HAMMETT

**Sodium chloride absorption by the ileum.** R. CONGR. *Biochem. Z.* 114, 33-57 (1921).—C. studied the absorption of mixts. of  $MgSO_4$  and NaCl and of  $Na_2SO_4$  and NaCl in the jejunum and the ileum of narcotized dogs. Tables are given of the amts. of the  $SO_4$  and Cl ions recovered from the tied-off segments, or fistulas used in the investigation. From a consideration of the results and the osmotic pressures of the administered and recovered fluids the conclusions are reached that the intestinal wall has the ability to prevent the diffusion of blood salts into the gut, to retard an osmotic exosmosis into the intestine and to absorb NaCl without the participation of filtration and diffusion forces, even when no simultaneous  $H_2O$  intake has occurred and against a diffusion tendency. This ability is lower in the ileum. A secretion of intestinal juice takes place during the absorption. The liquid flowing into the hypertonic  $SO_4$  solns, consists entirely of intestinal juice, in the production of which diffusion and osmosis play no part.

F. S. HAMMETT

**Blood calcium.** M. RICHTER-QUITNER. *Biochem. Z.* 114, 58-62(1921).—A brief discussion of the problem with no exptl. data reported. The opinion is expressed that when Ca is to be detd. in blood, defibrination must not be a part of the procedure, nor should Na citrate or oxalate be used as anticoagulants. Hirudin is advocated as the only suitable reagent for use in this connection; consequently Ca detn. in serum is unreliable.

F. S. HAMMETT

**The distribution of glucose between the red blood corpuscles and the surrounding fluid.** V. Physiology of blood sugar. R. EGG. *Biochem. Z.* 114, 88-110(1921); cf. *C. A.* 15, 1155.—E. stresses the necessity of the use of the hematocrit for the detn. of the corpuscular vol. in the study of the distribution of glucose in the blood. He reports a series of expts. on changes in vol. of red blood corpuscles of the dog, man, goat, beef and rabbit when put in contact with various concns. of NaCl and glucose and comes to the conclusion that these osmotic studies confirm the results of direct chem. analysis that the red blood corpuscles of the goat, beef, rabbit and dog are impermeable to glucose, while those of man are permeable to this substance. The permeability velocity was slight, which is opposed to what was to be expected from the chem. analysis. This divergency is explicable on the basis of the supposition that the glucose is tied up with or adsorbed by the corpuscular membrane.

F. S. HAMMETT

**Agglutination and sedimentation velocity of erythrocytes.** W. STÄRLINGER. *Biochem. Z.* 114, 129-44(1921).—Systematic studies on agglutination and sedimentation of red blood corpuscles in citrated blood, in defibrinated blood, and in birudinized blood show that the idea that agglutination is a factor in sedimentation is substantiated, in that the red blood cells clump together when sedimentation is rapid and that slow sedimentation in free suspension is related to the diln. The observations also demonstrate that the sedimentation velocity runs parallel and in the same direction with the fibrinogen content of the blood. Moreover, the addition of materials which act as hydrolytic agents on protein always strongly retards sedimentation. It appears then on the one hand as if an increase in polypeptide linkings on the surface of the corpuscles favors an increased suspensibility and lower agglutination and on the other hand as if the presence of a higher concn. of lesser dispersed protein compds. in the surrounding fluid gives rise to a lessened suspensibility and an increased tendency to agglutination.

F. S. HAMMETT

**The chemical composition of the red blood corpuscles.** W. FALTA AND M. RICHTER-QUITNER. *Biochem. Z.* 114, 145-51(1921).—An attempt at exptl. refutation of the

findings of Gad-Andresen (*C. A.* 15, 255) and others of the presence of Cl, glucose, N, Ca, etc., in red blood corpuscles. Cl and glucose detns. are reported from whole blood, blood plasma, serum, and corpuscles of man and various animals, previously defibrinated, treated with Na citrate, Na oxalate, hirudin or immediately drawn without addition of foreign substances. It was found that when whole blood is allowed to stand at any temp., when it is defibrinated by whipping with a rod of glass or wood, when it is centrifuged too long, when it is allowed to cool too much, or when Ca precipitants are added, erroneous results are obtained because of injury to the corpuscles, but that defibrination by shaking with glass beads does no such damage. While the statement has been made that the corpuscles are impermeable to sugar, yet it is not denied that sugar is utilized by the corpuscular metabolism, and the idea is expressed that the corpuscular sugar and the sol. N of the blood also are immediately utilized by the cells and hence are not ordinarily found therein. It is also admitted that in pathological conditions affairs may be different.

F. S. HAMMETT

**The auxorease function of serum.** M. JACOBY. *Biochem. Z.* 114, 152-6(1921).—J. presents evidence purporting to prove his priority in demonstrating that human blood serum as well as sera from other species can noticeably increase the activity of soy-bean urease.

F. S. HAMMETT

**The daily curve of the stalagmones.** S. ZANDRÉN. *Biochem. Z.* 114, 211-20(1921).—S. reports the 24 hr. output of the stalagmone or colloidal constituents of urine and the influence thereon of sleep and eating. He found that the elimination during the day is markedly lower than at night; after eating excretion seems to drop for a time and then rises. Other studies on the effects of variations in caloric intake and types of foodstuffs lead to the opinion that the colloidal material arising from the blood serum is in part significantly related to the type of food intake: protein and carbohydrate particularly seem to influence its excretion, while fat shows no such stimulating effect. The increased excretion on fasting is attributed to protein catabolism. Brief speculation is given of the various possibilities in this relatively recent field of investigation.

F. S. HAMMETT

**The sedimentation velocity of the red blood corpuscles.** P. GYÖRGY. *Biochem. Z.* 115, 71-84 (1921); cf. Rona and György, *C. A.* 14, 3013.—Wasbed red blood corpuscles of man and beef were used in these studies. The influence on sedimentation exerted by various concns. of lecithin, cholesterol, EtOH, thymol, camphor, tributyrin, Et<sub>4</sub>O, CHCl<sub>3</sub>, acetone, MeOH, propyl alc., amyl alc., heptyl alc., normal and secondary octyl alc., decyl alc., cholesterol in acetone, glyceroll, leucine, glycylalanine, leucylglycylalanine, and other amino acids; of methyl, ethyl, propyl, butyl and phenyl urethan, with and without N/, CaCl<sub>2</sub> soln., NaCl, BaCl<sub>2</sub>, MgCl<sub>2</sub>, HgCl<sub>2</sub>, ThCl<sub>4</sub>, AlCl<sub>3</sub>, NaI, KCl, KCNS, Na<sub>2</sub>SO<sub>4</sub>, K<sub>4</sub>Fe(CN)<sub>6</sub>, NaNO<sub>2</sub>, strychnine-NO<sub>2</sub>, quinine-HCl, methylene blue, Congo-red, eosin and crystal violet, was studied. The general conclusions are that lipoid-sol. substances such as EtOH, etc., reduce the sedimentation velocity of washed red blood corpuscles, while most of the nonelectrolytes, and even such electrolytes as quinine, strychnine, and coloring materials such as methylene blue, eosin Congo-red, etc., do not influence the process of sedimentation at all.

F. S. HAMMETT

**Urinary changes after a long swim.** SATA. *Chuo Igakkai Zasshi* No. 274, 347 (1918); *Jap. Med. Literature* 6, 11(1921).—After a swim of 5 knots, the urine contained albumin and both byaline and fine granular casts, which persisted for a period of 24 hrs.

JOSEPH S. HEPBURN

**Causes of variation of the zinc content of vertebrate animals.** GABRIEL BERTRAND AND R. VLADESCO. *Compt. rend.* 172, 768-70(1921); cf. *C. A.* 15, 397.—Zn was detd. in rats, rabbits, guinea pigs, fowls and 3 species of fish. More than 75 individual animals of ages from the embryonic state to adult years were tested. While certain figures

are somewhat erratic, the general conclusion is warranted that a max. of Zn in mg. per 100 g. of fresh material occurs at an early age.

L. W. RIGGS

**Changes in the composition of sheep milk during the course of the lactation period.** STEPHAN WEISSER. *Landw. Vers.-Sta.* 97, 131-40(1920).—Analyses of morning and evening milk are compared. Specific gravity, dry substance, fat, milk sugar, total N, total protein, casein, albumin, ash and refraction of the serum were detd. each month during lactation. Greater changes take place in sheep milk than in cow milk.

F. M. SCHERTZ

**Course of creatinine elimination in the urine, with particular reference to the effect of muscular activity.** WILHELM SCHULZ. *Arch. ges. Physiol.* 186, 726-71(1921).—The daily urinary elimination of creatinine in the normal individual upon a creatine-free diet fluctuates only within moderate limits—1.143 to 1.499 g. with a daily av. of 1.311 g. The amt. of urine eliminated is without effect on the creatinine output. In measuring daily elimination by 2-hr. periods certain fairly const. variations were observed, in that the amts. excreted between 9 and 11 A. M., 3 and 5 (or 1 and 3) P. M., and 9 and 11 (or 7 and 9) P. M., were higher. Food intake, or the earlier or later behavior of excretion had no effect upon the morning rise, nor does the afternoon rise disappear with the absence of food. All 3 maxima persisted during abstinence from food, although the afternoon rise was not as regular as on days of normal feeding. The total daily elimination decreases during hunger—from 1.311 g. or 19.3 mg. per kg. of a normal day to 1.098 g. or 16.1 mg. per kg. During hunger creatine appears, to disappear when the normal diet is resumed. Muscular activity, either under normal dietary conditions or on a hunger day, markedly increases the amt. of creatinine eliminated during the period of work although the daily output is not increased. G. H. S.

**Physiology of the liver. I. In hunger.** P. JUNKERSDORF. *Arch. ges. Physiol.* 186, 238-53(1921).—Detns. of the physiol. and chem. characteristics of the liver in dogs during starvation showed that the wt. of the liver decreased after 11 days of hunger to 2.7% of the body wt. (about 18.18% less than the accepted normal ratio of 3.3%). In different animals there were individual differences in the loss in liver wt., losses being proportional to the loss in glycogen but not parallel to the loss in general body wt. During short hunger periods the water content of the liver decreased. In the glycogen decrease there was much individual variation. After 11 days the glycogen content varied between 0.08 and 1.74% (av. 0.59%). In short hunger periods the residual glycogen of the liver can be explained by introduction from without but in long starvation there must be new formation within the liver. After a hunger period of 11 days the fat content of the liver amounted to 15.36% of the dry substance. II. Protein diet. *Ibid* 254-64.—When the diet consists of protein alone the liver is able to form glycogen from the protein, but the accumulation of glycogen is associated with a decrease in the fat content. Under such a diet the wt. of the liver increases, owing to an essential participation of the liver in protein metabolism since the change cannot be explained by increase in glycogen, fat, or water. Apparently there is within the liver a true protein feeding, seen in the formation of N-containing metabolic end-products. G. H. S.

**Sedimentation velocity of red blood corpuscles.** GEORG LINZENMEIER. *Arch. ges. Physiol.* 186, 272-89(1921).—Plasma shaken with kaolin or heated at 56° for ½ hr. retards sedimentation of red cells as compared with untreated serum. Fibrinogen, histone, and protamine aid sedimentation and decrease the naturally negative charge of the cells, while albumin, nuclein, nucleic acid, and peptone are indifferent. The stimulation of sedimentation through altering the elec. charge of the cells occurs only under those conditions where it is possible to find definite substances—albumin, Na nucleate, gelatin, histone, protamine—upon the surface of the cells. The sedimentation capacity of red cells is species specific. G. H. S.

**Cholesterol content of human and cow milk.** L. WACKER AND KARL F. BRCK. Z.



*Kinderheilk.* 27, 288-92(1921).—Cholesterol is present in milk in the form of cholesterol fatty-acid esters. The av. values found were: human milk, fat 3.29%, cholesterol 0.1385%; cow milk, fat 3.65%, cholesterol 0.1258%. G. H. S.

### G—PATHOLOGY

R. GIBSON WELLS

A study of the blood and its circulation in normal infants suffering from chronic nutritional disturbances. K. UTHEN. Washington Univ., St. Louis. *Am. J. Diseases Children* 20, 366-92(1921).—In a number of infants, from 1 day to 10 or 11 months old, refractometric protein detn. in blood serum showed 6. to 6.5%. Then the protein content begins to rise and reaches the adult level (about 8%) by the 15th month. Premature infants up to 10 weeks gave figures between 3.94 and 5.9%. They did not reach normal values before they were 3 mos. of age. No marked daily changes could be found in 13 infants. The blood of 37 atreptic infants (1 to 18 mos. of age) contained from 3.94 to 5.9% protein. In a variety of other diseases the protein content of the blood serum did not vary from normal with the exception of exudative diathesis and nephritis; both of which have low values.

S. AMBERG

A study of the urine sugar in infants. R. M. GREENTHAL. Cornell Univ. Med. College. *Am. J. Diseases Children* 20, 556-61(1920).—The urine sugar was detd. by the method of Benedict and Osterberg, with some modifications suggested by Benedict. With a diet contg. 6-7.5% sugar the infants excreted 100-400 mg. sugar *in toto*, calcd. for 24 hours, 45 to 150 mg. being in the form of unfermentable sugar. With the increase of sugar in the diet the sugar excretion increases. All or nearly all of this increased sugar is fermentable.

S. AMBERG

Calcium in the blood of children. W. DENIS AND F. B. TALBOT. Mass. Gen. Hosp., Boston. *Am. J. Diseases Children* 21, 29-37(1921).—The method of Lyman (nephelometric) was used with some modifications. Na citrate 0.1 g. was added to 10 cc. of blood. This does not ppt. any Ca. The plasma was used for the Ca detn. In place of the 1 standard equiv. of 0.2 mg. Ca used by Lyman, 3 standards were pptd. of 0.2, 0.15 and 0.1 mg. Ca. Under these conditions the readings of the unknown come closer to the known and are therefore more accurate. Normal adults gave 7.2 to 12.1 mg. Ca per 100 cc. of plasma with an av. of 10 mg. Ca. The blood of 119 children suffering from various ailments was examd. In 7 cases with acute rickets 8-12 months of age, the Ca varied from <2 mg. to 8 mg. per 100 cc. of plasma. In 21 convalescent cases 6 months to 4 years of age, the Ca varied from 4.5 to 11.2 mg. Tetany cases (12 observations, 4 to 22 months of age) gave about 1 to 7.7 mg., 7 remaining under 5 mg. In 4 cases of convulsions without tetany the Ca varied from 3.2 to 8.2 mg. In 4 cases of epilepsy it was 3 to 9 mg. and in the chorea cases 4.8 and 6 mg. In 23 cases of pneumonia (6 months to 7½ years) the Ca varied from less than 2 to 12.1 mg. In a number of the cases the Mg was also detd.

S. AMBERG

Complement fixation test for tuberculosis in children. J. V. COOKE. Washington Univ., St. Louis. *Am. J. Diseases Children* 21, 78-88(1921); cf. C. A. 14, 770.—The results are summarized in a table from which the following data are taken. The children were up to 15 years of age. Of 630, with a negative cutaneous tuberculin test, 48 (7.6%) gave a positive tuberculosis fixation test; of 522 cases, in which the cutaneous tuberculin test had not been done, 49 (9.6%) gave a positive fixation test, and of 404 cases with a positive cutaneous test, 180 (44.4%) gave a positive fixation test.

S. AMBERG

Precipitins to egg-white in the urine of new-born infants. C. G. GRULKE AND B. E. BONAR. *Am. J. Diseases Children* 21, 89-95(1921).—New-born infants received a 2% soln. of egg white between feedings in place of plain water. Single specimens of urine of 23 different infants were examd. In all 136 specimens were examd. Of

these 33 gave a positive precipitin reaction. Control specimens to the number of 41 from 17 different patients did not give any reaction. The total amt. of egg-white eliciting a positive precipitin reaction varied from 0.14 to 0.75 g. per kg. The first positive reactions occurred on the 4th day. No reactions were obtained after the 11th day.

S. AMBERG

The nature of the reducing substance in the urine of infants with nutritional disorders. O. M. SCHLOSS. Cornell Univ. *Am. J. Diseases Children* 21, 211-9(1921).—In a series of cases suffering with severe nutritional disturbances, the sugar content of the urine was detd. by the method of Benedict or Bertrand, or by that of Benedict and Osterberg. The greater amt. of reducing substance was largely destroyed by yeast. In a number of cases the urine after fermentation still reduced Benedict's qual. reagent, which may have been due to the presence of a small amt. of lactose. Where osazones could be prepd. their appearance, m. p. and insoly. in hot water all point to glucose; so does the speed with which fermentation occurs. Where quant. detns. by the method of Bertrand could be compared with the rotation, the latter corresponded more closely to the sp. rotation of glucose than to that of galactose. In a number of cases this sugar did not disappear even when no lactose was ingested. The mucic acid test was uniformly negative. All these data show that the sugar excreted in the urine of these infants suffering from nutritional disorders is glucose. When the food contains moderate or larger apts. of lactose, this sugar may form, exceptionally, the greater portion of the reducing substance.

S. AMBERG

Toxic symptoms in infants and children with gastro-intestinal manifestations. H. SCHWARZ AND J. L. KOHN. Mt. Sinai Hosp. *Am. J. Diseases Children* 21, 465-71 (1921).—A number of infants was examd. which were acutely and seriously ill. The purpose was to ascertain whether there was any relationship between the clinical symptoms and the blood findings. The blood examn. included detn. of urea, non-protein N, uric acid, creatinine,  $\text{CO}_2$  and cholesterol. There may be wide variations in the chem. compn. of the blood without difference in the clinical picture.

S. AMBERG

Anoxemia as a factor in acute gas poisoning. J. BARCROFT. *J. Roy. Army Med. Corps* 36, 1-18(1921).—B. considers that no single condition so aptly illustrates the various types of anoxemia and their possible combinations with one another as does poisoning with pulmonary irritant gas as Cl or phosgene. Exptl. studies on goats, and observations on gassed soldiers can be referred to various combinations of the anoxic type, in which the O-pressure is too low and hemoglobin is not normally satd., the anemic type, in which O-pressure is normal but the amt. of functional hemoglobin is too small, and the stagnant type, in which the blood is normal but the tissue circulation is deficient. The exptl. studies indicate a combination of 3 different types of treatment: (1) bleeding and infusion of saline, (2) O-treatment, (3) rest (including warmth).

A. T. C.

Carbon monoxide poisoning in warfare. W. J. RUTHERFORD. *J. Roy. Army Med. Corps* 36, 115-24(1921).—"Mine-gas poisoning" is usually met with among men of the engineer units engaged in mining and countermining. Symptoms and after-effects in various cases are detailed. Such CO-poisoning may occur in civil life following the rise of blasting charges.

A. T. CAMERON

Acidosis in operative surgery. LILLIAN K. F. FARRAR. New York. *Surgery Gynecology Obstetrics* 32, 328-39(1921).—The range of  $\text{CO}_2$ -combining power of blood in women (150 cases; Van Slyke method) is 55.2 cc. to 69.9 cc. per 100 cc. blood plasma, or about 8 points lower than Van Slyke found for man. Hence the danger line is sooner reached, which accounts for the greater frequency of acidosis following operations in women than in men. The fall of alkali reserve during operation depends not only on the anesthetic and the duration of the operation, but on the nature of the latter and the occurrence of hemorrhage and shock, bearing a close relation to fall in blood- and

pulse-pressure. A soln. of glucose given intravenously during operation, at the rate of 0.8 g. per kg. body weight each hr., lessens the acidosis incident to operation by promoting metabolism. A soln. of gum acacia (6%) in glucose (20%) given at a sub-tolerant rate throughout the operation is an aid to the maintenance of blood-pressure. Carbohydrate feeding before and after operation together with use of  $\text{NaHCO}_3$  will help to prevent or lessen acidosis.

A. T. CAMERON

**Celiac infantilism.** REGINALD MILLER. *Lancet* 1921, I, 743-6; cf. *C. A.* 15, 115.—The excessive fat loss in celiac disease is not due to an enteritis. The condition is independent of organic changes and must be due to a digestive fault, probably a defective action of bile on fat-absorption.

E. B. FINK

**Researches on the biochemistry of germs and other proteins, with special reference to the problems of immunity.** DAVID THOMSON. London. *Lancet* 1921, I, 795-8.—By treating gonococci with alkali a ppt. of non-toxic meta-protein was obtained with a supernatant fluid containing toxic primary and secondary proteoses. A certain amt. of immunity appears to be developed against the proteoses, since after repeated injections they lose their focal provocative action. They also give pos. results when used as antigens in the complement-fixation test for gonorrhea. They appeared to be good antigens when pptd. with alc., and comparatively poor antigens when pptd. with  $(\text{NH}_4)_2\text{SO}_4$ . Possibly the latter alters them in some way. The tubercle bacillus was found to contain 4 different fractions: (a) alkali-sol. meta-protein + proteoses; (b) acid-sol. meta-protein + proteoses; (c) alc.-sol. substance; (d)  $\text{CHCl}_3$ -sol. substance. For the successful splitting up of the tubercle bacillus as well as of other germs and proteins, it is interesting to note that the above order of analyses must be maintained. In a series of analyses it was revealed that each different germ and each different animal tissue contained the various components common to all, in widely varying proportions. Solubility in alkali of various germs and tissues depends upon the amt. of their lipid content. The less the amt. of alc.-sol. substance (lipoid) present the greater is the solubility in alkali, and *vice versa*. This fact is so striking that one can prophesy a low lipid content in a portion which dissolves readily in weak alkali. Expts. to test the antigenic properties of the acid-sol., alc.-sol., and  $\text{CHCl}_3$ -sol. fractions as estd. by the complement fixation reaction and by the therapeutic results obtained when injected into gonorrheal subjects, showed that the 2 former components gave good results when used as antigens in the complement-fixation test for gonorrhea. Inoculation expts. in human subjects showed that they were no more toxic than the alkali-sol. components of the germ. These expts. were repeated with the component parts of the tubercle bacillus with approx. the same results.

E. B. FINK

**The hippuric acid synthesis test.** P. LOUIS VIOLETTE. *Vittel. Lancet* 1920, 1, 884-5.—It is logical to believe that a study of hippuric acid elimination may give useful data as regards the functional condition of the kidney, since the synthesis of hippuric acid is one of the functions of the kidney epithelium. With the patient on a uniform diet, the amt. of hippuric acid eliminated is detd. The patient is then given a dose of 0.5 g. each of benzoic acid and glycocholl, following which a 24 hr. specimen of urine is collected. Normally the synthesis should be complete within that time, and analysis should show an excess over normal of about 0.74 g. for 24 hrs. The total amt. should be about 1.14 g. When the figure is as low as 0.50-0.40 g. the hippuric function is abnormal and there is probably some parenchymatous renal disorder. The test is most useful if carried out several times at fixed intervals.

E. B. FINK

**Uric acid, urea, and creatinine determinations in the blood as an aid in the diagnosis of renal disease.** C. K. WATANABE. *Kyoto Igaku Zasshi* 15, No. 1, 72-84 (1918); *Jap. Med. Literature* 6, 2 (1921).—The creatinine is the most important single factor in prognosis; an almost certain fatal termination is indicated by 5 mg. or more of creatinine per 100 cc. of blood. Uremia is indicated if the blood contains 4 mg. of creatinine

and 80 mg. of urea per 100 cc. A high urea content combined with a low creatinine content is of doubtful significance. Detn. of uric acid alone is of but little value; a high uric acid content is not diagnostic of gout.

JOSEPH S. HEPBURN

**Hemolysin production in the cerebrospinal fluid.** C. HAOR. *Iji Shimbu* No. 995, 477(1918); *Jap. Med. Literature* 6, 10(1921).—After intraperitoneal or intravenous injection of the blood of the goat or of the guinea pig into rabbits, hemolysin was present in the cerebrospinal fluid, and could be detected in dilns. of the fluid ranging between 1 in 5 and 1 in 10, as compared with dilns. of the serum ranging from 1 in 2500 to 1 in 5000.

JOSEPH S. HEPBURN

**The volume of the blood during pregnancy.** ALFONS MAHNGRT. Univ. of Graz. *Arch. Gynaekol.* 114, 168-96(1920).—There is an increase in the vol. of the blood during the 2nd. half of pregnancy, particularly during the last 2 months. The total amt. of serum albumin is slightly increased, but there is a marked decrease in the % of serum albumin, indicating that the increase in vol. of the blood is due for the most part to an increase in the fluid portion of the blood. The increase in serum albumin is in direct proportion to the gain in wt. in the 2nd half of pregnancy. As the red blood cell count per cu. mm. remains normal there must be an actual increase in the no. of red blood cells.

HARRIET F. HOLMES

**The presence of hemolytic substances in human urine.** ERIC PONDER. Univ. of Edinburgh. *Brit. J. Exp. Path.* 2, 34-40(1921).—Using the technic of McKee (*C. A.* 10, 217) hemolytic activity was observed as a regular occurrence in the urines of insane persons and also in the urines of healthy persons. The hemolytic substance appeared to be a stable chem. compd., capable of being extd. from the urine with various solvents. Its hemolytic activity was inhibited by various substs. such as dil. alkalies, lipoids, cerebrospinal, orchitic and other body fluids, and notably blood serums. As bile acids and their salts are very highly hemolytic and are inhibited in their hemolytic activity by these same substances it is probable that the hemolytic power of urine depends on its contg. minute traces of bile acids or their salts, and that the occurrence of hemolytic activity in urine is physiological.

H. F. HOLMES

**The Sachs-Georgi syphilis reaction and its relation to the Wassermann reaction.** TENJI TANIGUCHI. Glasgow Univ. *Brit. J. Exp. Path.* 2, 41-8(1921).—The Sachs-Georgi syphilis reaction depends on the formation of ppts. when the sera are mixed with cholesterolized alc. tissue exts. Examg. 296 sera for the Sachs-Georgi and for the Wassermann reactions, 91.2% gave the same result and 8.8% showed discrepancies. The largest portion of the discrepancies occurs in the cases which are suspicious to the Wassermann test but negative to the Sachs-Georgi reaction, owing apparently to the lesser delicacy of the latter reaction attributable to the difficulty of detecting slight pptn.; the general differences have been observed only in the case of weak or doubtful reactions. When the amt. of complement fixed by the standard amt. of serum in the Wassermann reaction is compared with the concn. of serum required to cause pptn. there is also seen to be a close parallelism. The precipitable substance in the Sachs-Georgi reaction consists mainly of the lipoids contained in the emulsion.

H. F. HOLMES

**Hemagglutination and its medico-legal bearing, with observations upon the theory of isoagglutinins.** H. SCHÜTZE. Lister Inst., London. *Brit. J. Exp. Path.* 2, 26-33 (1921).—The possibility of grouping dried human blood specimens by reconstructing the serum for agglutination and using the undissolved residue for absorption has been demonstrated. Forensically the test would be of most importance when proving dissimilarity between 2 specimens alleged to be derived from the same source. To prove their similarity would probably only be to furnish circumstantial evidence of more or less value according to the group in question, and the frequency of the occurrence of that group in the population concerned. The Landsteiner theory that two substances,

"A" and "B," with their corresponding agglutinins, "a" and "b," are concerned in the isoagglutination of human blood has been confirmed by absorption tests.

HARRIET F. HOLMES

Twenty years personal experience with *glicosuria*. C. M. COBB. *Am. Med.* 27, 94-7(1921).—A report of the author's self treatment for diabetes. F. S. H.

Studies of the methods of refractometric investigation of serum as applied to the protective enzyme (micro-Abderhalden reaction). H. MEYER. *Biochem. Z.* 114, 194-210(1921).—Thymol apparently does not interfere with the detn. of the  $n$  of blood serum. Tables are given of the  $n_D$  of the serum from various types of patients treated with desiccated lung, spleen and testicular tissue according to the Abderhalden technic. M. is of the opinion that the method may have its uses after it has been systematically tested out with all the necessary organs and tumor substrates, so that a differential analysis is possible. F. S. HAMMETT

Chemical studies of organs. I. Composition of the liver in acute yellow atrophy. JON. FEIGL. *Biochem. Z.* 115, 22-38(1921).—F. reports results of analyses of liver tissue from 24 cases of hepatic disease. The wt.,  $H_2O$ , dry wt., total fat, total ash, residue, coagulable N, non-coagulable N, urea N, creatinine and creatine N, and undetd. N are given in the 2 tables. The results are taken to indicate a tendency to an increased  $H_2O$  content. The total fat was indeterminate. The variability in the ash was of such a nature that no conclusion is possible. In fact the values of all the constituents show such wide variations that any valid deductions are precluded. F. S. HAMMETT

The presence and distribution of fats and lipoids in blood after hemorrhage. JON. FEIGL. *Biochem. Z.* 115, 63-70(1921).—Observations are reported of the total fat, lecithin and total cholesterol in blood from patients after operative hemorrhages, from cases of severe hemorrhages from gastric ulcers, from women with excessive menstruation, from cases of hemorrhages in pulmonary tuberculosis, from venesection, and from some expts. on animals. The general indications are that lipemias of varying degrees of intensity tend to follow any marked loss of blood by the organism. F. S. HAMMETT

The colloidal benzoin reaction compared with the colloidal gold reaction in non-syphilitic diseases of the neuraxon. G. GUILLAIN, G. LAROCHE AND P. LECHELLE. *Bull. mem. soc. med. hop.* 37, 355-7(1921).—A criticism of the colloidal gold reaction couched in general terms and based on the observation that the test is given in pathological conditions other than syphilis, which is not observed with the colloidal benzoin test. F. S. HAMMETT

Diabetes insipidus as a hypopituitary syndrome. G. MARANÓN. *Endocrinology* 5, 159-73(1921).—M. presents evidence which he considers conclusive as establishing a diminished hypophyseal function as the etiological basis of diabetes insipidus. F. S. HAMMETT

Albumin, lymphocytic cells and tubercle bacilli in the sputa. K. TAKRUCHI. *N. Y. Med. J.* 113, 574-7(1921).—Examn. of the sputa of 77 cases of positive presence of tubercle bacilli in sputa as compared with 55 cases where no bacilli were found, with respect to the albumin and lymphocyte content, showed that when the bacilli are present, then albumin, and lymphocytes and eosinophiles also are usually present, and that when no bacilli are present none of the other 3 is found. F. S. HAMMETT

Experimental studies in diabetes. Series II. The internal pancreatic function in relation to body mass and metabolism. 7. The influence of cold. F. M. ALLEN. Rockefeller Inst. *Am. J. Physiol.* 54, 425-38(1921); cf. *C. A.* 15, 1747.—Expts. were done on partially depancreatized dogs. There is no demonstrable difference in the proportion of pancreatic tissue that must be removed to produce diabetes in dogs in warm or cold environment. The influence of cold is not equivalent to the removal of the smallest fraction of a g. of pancreatic tissue. Cold environment usually but not

always caused hyperglucemia, more easily and in higher degree as the power of sugar utilization was impaired. 8. The influence of extremes of age upon the production of diabetes. *Ibid* 439-50.—Senile dogs do not appear to differ in susceptibility to diabetes from normals. The tendency to diabetes is distinctly less in puppies than in adult dogs. There is no specific tendency to rapidity of downward progress or to diabetic acidosis in puppies. 9: The influence of pregnancy upon experimental diabetes. *Ibid* 451-59.—Expts. on dogs with partial pancreatectomy show that diabetes is not seriously aggravated by the increased metabolism of pregnancy. The expts. are opposed to the view that any appreciable amt. of internal pancreatic secretion passes from the fetus to the mother.

J. F. LYMAN

The effects of anoxemia on the respiratory center in decerebrate animals. LOIS MCPHEDRAN FRASER, R. S. LONG AND J. J. R. MACLEOD. Univ. Toronto. *Am. J. Physiol.* 55, 159-74(1921).—Decerebrate cats breathing through a closed system with soda-lime absorbers showed a distinct increase in respiratory vol. when the alveolar  $O_2$  was reduced to 15.25% to 17.7% and became progressively more and more marked as the % fell below this. The resistance to breathing offered by the system of valves and absorbers used itself brings about a slight degree of hyperpnea which makes uncertain the exact degree of anoxemia required to produce increased lung ventilation. In several expts. no change in arterial  $CO_2$  was detd., but in others a decrease was evident.

J. F. LYMAN

Periodic breathing and the effects of oxygen administration in decerebrate cats. J. J. R. MACLEOD. Univ. Toronto. *Am. J. Physiol.* 55, 175-83(1921).—Periodic breathing may be induced in many decerebrate cats by various ways, all of which tend to produce anoxemia: 1. by periodic compression of the vertebral arteries, 2. by respiring through a tube containing soda-lime, 3. by increasing the dead air space of the lungs, 4. by respiration in atms. containing from about 8 to 12%  $O_2$ . In several such cats normal breathing was reestablished, and the prepn. maintained for several hours in excellent condition by the administration of  $O_2$ .

J. F. LYMAN

The concentration of lactic acid in the blood in anoxemia and shock. J. J. R. MACLEOD. Univ. Toronto. *Am. J. Physiol.* 55, 184-96(1921).—Acute anoxemia was accompanied by a rise of lactic acid in the blood, the rise being noticeable within 10 mins. from the start of the condition. The return to the normal after anoxemia was relatively slow. In shock, induced by manipulation of the duodenum, lactic acid of the blood did not increase until the condition was so far advanced that arterial blood pressure had fallen to 40 mm. Hg. Since a condition that is ultimately fatal becomes established at a much earlier stage, it is concluded that there is no causal relation between blood lactic acid, and shock. The increased lactic acid in anoxemia is regarded as due to "alkalosis" set up by the excessive removal of  $CO_2$  from the blood by the increased lung ventilation.

J. F. LYMAN

The serological diagnosis of syphilis by means of Sachs and Georgi's reaction test. J. A. DeNOY. *Medelingen Geneeskundig Lab. Weltevreden* [3] 1920, 376-97.—The Wassermann and Sachs and Georgi indexes were in general parallel for the 500 sera and liquors examd. The Wassermann reaction was negative for 14 sera and 3 liquors which gave a positive S. and G. reaction. Of these 8 were from syphilitic patients. In cases where it is impossible to take the W. reaction the S. and G. reaction may be applied as a trustworthy substitute.

ALBERT R. MERTZ

Action of phenol upon animal vaccine. V. BABES AND S. BORGES. *Bull. sec. sci. acad. Roumaine* 6, 36-43(1920).—Since the aseptic prepn. of vaccines is practically impossible, the problem is to devise means to render vaccines sterile without changing their physiol. action. Among antiseptics tried were various acids and alkalies,  $HgCl_2$ ,  $HCHO$ , "novasurol," "novasu" and phenol in a concn. of 0.5%. An untreated vaccine after 8 days contained many diverse bacteria; a sample of the same vaccine treated with

0.5% phenol showed only a few colonies of staphylococci after 8 days, and after 14 days was sterile. By testing the treated vaccine on calves and rabbits positive results with typical pustules were obtained.

L. W. RIGGS

**Uric acid in gout and gravel.** A. CHAUFFARD, P. BRODIN AND A. GRIGAUT. *Presse med.* 29, 153-6(1921). Cf. C. A. 15, 897.—It is not possible to est. uric acid in the blood from its concn. in urine. The disturbance of metabolism first manifests itself as by-purricacidemia, then hypercholesterolemia, and finally bilirubinemia. H. A. S.

**Antipneumococcus vaccine.** L. CHEINISSE. *Presse med.* 29, 188(1921).—A review. H. A. SHONLE

**Nitrous oxide and cholemia.** E. DESMAREST AND LASCOMBES. *Presse med.* 29, 194-6(1921).—After use of  $\text{Et}_2\text{O}$  and  $\text{CHCl}_3$  for general anesthesia, a pronounced cholemia appears which takes 5-6 days to disappear. A mixt. of  $\text{N}_2\text{O}$  and  $\text{O}_2$  never produced cholemia, indicating that this anesthetic does not affect the liver.

H. A. SHONLE

**Tetany after parathyroidectomy and calcium deficiency.** PAUL TRENDLENBURG AND WALTHER GOEBEL. *Arch. exp. Path. Pharm.* 89, 171-99(1921).—In order to associate removal of the parathyroids with Ca deficiency and with tetany the isolated frog heart was employed for detecting alterations in the Ca ion concn. in the serum. With this indicator the sera from normal cats were compared with those secured from cats in tetany resulting from parathyroidectomy. A marked difference in the reactions of the heart was observed and the addition of Ca in suitable amts. to the "tetany sera" completely restored their activity. The serum of cats manifesting tetany through intoxication with Na oxalate induced the same reaction response as that of cats subjected to operative procedure. In tetany there is not only a de-ionization of the Ca but the total Ca of the serum is depressed, and this deficiency appears sufficient to explain the conditions noted in tetany. The decrease in Ca during tetany amts. to 2.9-4 mg. per 100 cc. of serum. Evidences of Ca deficiency appear within about 6 hrs. of the operation. G. H. S.

**Organ-specific substances of specific action.** EMIL ABDERHALDEN AND WILHELM BRAMMERTZ. *Arch. ges. Physiol.* 186, 365-71(1921).—The O consumption of tadpoles of *Rana esculenta* was detd. under various conditions and when subjected to different preps. obtained from several tissues and organs and from hydrolyzed yeast. The yeast "opton" in dilns. of 1:100 to 1:10,000 regularly markedly stimulated, and then inhibited, development of the eggs of *Rana*. Testes and corpus luteum optons both greatly favored development. Thymus opton had no effect, and that prepd. from ovarian tissue deprived of corpora lutea was also inert. Various fractions were derived from the ovarian prepn.; the acetone-sol. fraction was toxic and inactive, the acetone-insol., alc.-sol. fraction was inert, and the portion insol. in both alc. and acetone stimulated almost as well as the original prepn. G. H. S.

**Glycemic reactions in infants.** FRITZ GORTZKY. *Z. Kinderheilk.* 27, 195-206 (1920).—The so-called glycemic reaction (an expression of intermediary carbohydrate metabolism as indicated by the blood sugar curve after the oral administration of sugar) is of diagnostic significance, and in selected cases provides a guide for therapy. The glycemic curve is of greater reliability for diagnostic purposes than is titration of the urine for glucosuria. G. H. S.

**Decomposition of maternal blood the cause of icterus neonatorum.** B. SCHICK. *Z. Kinderheilk.* 27, 231-50(1921).—The decompn. of maternal blood within the fetus is a normal physiol. process associated with blood formation. G. H. S.

**Iron content of the placenta and icterus neonatorum.** RICHARD WAGNER. *Z. Kinderheilk.* 27, 251-61(1921).—The av. Fe content of the placenta associated with full-term births was 2.86 mg. per 100 g. of moist tissue, and of the series of cases from which this figure is derived pronounced icterus was present in the fetus in only 1 case,

that showing a high Fe content of 4.49 mg. Placental tissue associated with premature births showed an av. of 4.37 mg. of Fe, and in this series only 1 case, with a low Fe value of 1.86, failed to show icterus.

G. H. S.

**Bodily resistance in infants.** HANS LANGER AND R. KYRKLUND. *Z. Kinderheilk.* 27, 302-22(1921).—The bactericidal power of the blood in the new-born is usually very low, but during the first few days of extra-uterine life there is an increase, and at the end of about the 5th day a const. value has been reached which is unaffected by dietary conditions and is not influenced by chronic digestive disturbances or intoxications. Acute disturbances are preceded by a decrease in bactericidal action of the serum.

G. H. S.

**Physiology and pathology of respiration. I. In infants.** A. ECKSTEIN AND E. RÖMINGER. *Z. Kinderheilk.* 28, 1-37(1921).—Studies on the vol. and rate of respiration are presented, together with analyses of the different types of respiration in such pathol. conditions as alimentary intoxication, pneumonia, and stenosis of the larynx. The av. rate of respiration of a normal child during the first year is 37-49 per min., with variations from 30 to 70 per min. In young infants the av. vol. is 10-13 cc., increasing at 6 mos. to 18 cc., and at 1 yr. to 30 cc. Pathol. conditions cause relatively large variations. During the first year the abs. vol. varies between 600 and 1000 cc. per min.; the relative vol. between 100 and 200 cc. per min. and kg.

G. H. S.

**Determination of the proteolytic enzyme in the juice of tumors and serums of the cancerous.** LORPER, G. FAROY AND G. TONNET. *Compt. rend. soc. biol.* 83, 993(1920); *J. pharm. chim.* 22, 392-4(1920); cf. *C. A.* 10, 2752.—The strongly active enzyme of cancerous tissue resembles ereptase. To det. its activity, mix 9 cc. of 2% peptone soln. with either 1 cc. of fresh and sterilized serum, or 2 cc. of tumor ext. (To prep. the latter, dry the tumor *in vacuo*, ext. with glycerol, ppt. with EtOH and dissolve in H<sub>2</sub>O.) Put the mixt. into an incubator for 24-48 hrs., detg. the aminoacids (A) by the formal method before and after incubation. Before incubation, the amt. of A was practically uniform for the peptone soln. and all the mixts. (0.037-0.039); after 48 hrs. warming, the amt. of A in the peptone soln. was about the same, 0.039. In the ovarian tumor mixt. it increased to 0.042, in the stomach tumor mixt. to 0.045. The amts. of A are much higher in the serum mixts.; with normal serum 0.056, that of cancer of the stomach 0.086, cancer of the breast 0.084. Thus the use of peptone soln. shows the presence of enzyme in tumors, and a greater amt. in the blood, and allows to account for the lowering of the azotemic coeff.

S. WALDBOTT

**The Wassermann test in the public health laboratory.** R. L. KAHN. Mich. Dept. of Health, Lansing, Mich. *Am. J. Public Health* 11, 410-5(1921).—K. believes that the public health lab. in running Wassermann tests should (1) titrate complement and amboceptor daily, (2) remove natural amboceptor from serum as a routine procedure, (3) obtain a daily picture as to the behavior of the antigens, (4) include a doubtful (+) in its control system, (5) run the tests in duplication with two antigens from different sources.

NATHAN VAN PATTEN

FISCHER, MARTIN H.: *Edema and Nephritis*. 3rd Ed. New York: John Wiley and Sons. 922 pp. \$10.

RICHTER, CH.: *Die Anaphylaxie*. Leipzig: Akademische Verlagsgesellschaft. 221 pp. M. 22. For review see *Deut. med. Wochschr.* 47, 453(1921).

RUBINSTEIN, M.: *Traité pratique de sérologie et de sérodiagnostic*. Paris: A. Maloine e. fils. 24 fr. 20. For review see *Boll. chim. farm.* 60, 165(1921).

#### H—PHARMACOLOGY

ALFRED N. RICHARDS

**Silver-salvarsan in the treatment of syphilis.** CHARLES M. WALSON. U. S. Army. *Am. J. Med. Sci.* 161, 418-37(1921).—After studying 800 cases W. advises the use



of Hg with Ag-salvarsan until it has been definitely proved that the Hg is unnecessary. Energetic and intensive Ag-salvarsan and Hg treatment are indicated in early primary syphilis during the prepositive Wassermann period. A salvarsan in so-called abortive treatment of syphilis is not so dangerous as other arsenobenzene preps. Ag-bibliography is appended.

H. V. ATKINSON

**Internal action of picric acid.** HANS SIEBERT. *Arch. Schiffs-Tropen-Hyg.* **24**, 334-6(1920).—Pure picric acid was given to a man in doses of 0.25 g. daily for 8 days and then every second day for a long time without injury, but finally the skin became yellowish. It is suggested that picric acid may be useful to kill tissue parasites.

H. V. ATKINSON

**Mechanism of the poisonous action of aromatic nitro-compounds and respiration problems of animal and plant cells.** WERNER LIPSCHITZ. *Z. physiol. Chem.* **109**, 189-258(1920).—Living cells can remove 2 atoms of O from insol. nitro-compds., such as *m*- or *o*-dinitrobenzene or dinitrotoluene. In this (endothermic) reduction the yellow nitrophenylhydroxylamines are formed; these are powerful poisons, the administration of which leads to morphological blood-changes as well as to chem. alterations such as formation of methemoglobin. Any condition which hinders cell respiration, such as impairment of cell structure, narcotics, HCN, high temp. or removal of the thermostable coenzyme by washing, at the same time removes the power to form nitrophenylhydroxylamines; *m*-dinitrobenzene was employed as a sensitive reagent for the measurement of respiratory power in expts. on mammalian lungs, kidneys, liver, gastric mucosa, and muscle; also on yeast, yeast maceration juice, and germinating plant cells. Support was given to Meyerhof's theory of the identity of the coenzymes of respiration and fermentation, by the observation that when boiled muscle or yeast juice was added to muscle which had been inactivated by washing, the reducing power was restored. Under anaerobic conditions muscle reduced more promptly, indicating that the nitro-compd. acts as a true H acceptor in the respiratory process. For estg. the intensity of respiration, e.g., in different species of animals, the amts. of nitrophenylhydroxylamine formed were estd. spectroscopically by finding the time taken to form methemoglobin when the filtrates were treated with hemoglobin. The formation of the toxic nitrophenylhydroxylamines is an example of an individual factor in toxic action; a second is the detoxifications by conversion to nitranilines; while a third factor is the sensitiveness of various tissues to the drug, in the present case the blood being most sensitive.

H. V. ATKINSON

**Recent tendencies in chemotherapy.** H. H. DALE. *Proc. Roy. Soc. Med.* **14**, *Sect. Therap. and Pharmacol.* **1921**, 7-15.—A review.

A. T. CAMERON

**The action of quinine on pregnant uterus.** HUGH W. ACTON. *Lancet* **1921**, **I**, 216-8.—Quinine causes contraction of both the longitudinal and circular fibers of the uterus. The effect produced depends on the concn. of quinine present—weak concns. (1-300,000) have no effect; concns. of 1-150,000 produce contractions under certain conditions; 1-44,000 produces tonic spasm, which, if continued, would cause asphyxia of the fetus from constriction of the placental sinuses. This concn. could only be attained if the patient was nearly poisoned by a large dose of quinine.

E. B. FINK

**Further researches upon antimony in the treatment of filariasis.** GEORGE C. LOW AND ELIZABETH J. O'DRISCOLL. *Lancet* **1921**, **I**, 221-2.—Injections of Sb produced no marked effect in 2 cases of filariasis. The As group also appears to be useless. Emetine had no effect upon the infection in 1 case.

E. B. FINK

**Further notes on the intravenous injection of antimony tartrate.** Leucoderma and skin complications; administration of large doses. J. B. CHRISTOPHERSON. *Lancet* **1921**, **I**, 522-5; cf. *C. A.* **13**, 2714.—Sb tartrate (K or Na) when given intravenously in appropriate dila. and administered with care may be given in larger doses than is generally supposed. The blood, considered as a tissue, is probably capable of

withstanding more physical and chem. abuse than any other organ; but owing to its structure and distribution it is obviously incapable of resisting micro-organic invasion, and is the logical route for direct attack upon micro-organic and other diseases, particularly of the blood stream itself. The cure of parasitic diseases such as bilharzia, kala-azar, trypanosomiasis, filariasis and dracunculosis is by a drug given intravenously depends upon: (1) the permeability of the enclosing membrane of the parasite; (2) the penetrating power of the drug which in turn depends upon its physical condition or chemical structure; (3) the toxicity of the drug for the parasite. ~~W. FINK~~

**War gas poisoning. I. Irritant gases.** FERDINAND FLURY. *Z. exp. Med.* 13, 1-15 (1921).—The action of irritant gases and anesthetics may be either local or, as a result of local absorption, general toxic effects on the tissues may be produced. Phosgene was selected as an example of a light, volatile gas, destroyed by  $H_2O$  and producing its effect by toxic action. Chloropicrin belongs to the medium volatile substances. It is not destroyed by  $H_2O$  and produces marked local irritation and absorptive action. Bis-( $\beta$ -chloroethyl) sulfide is only slightly volatile and is slowly destroyed by  $H_2O$ , its sensory action is practically nil and it has a most marked general toxic effect. **II. The destructive action of water on war gases.** P. RONA. Berlin. *Ibid.* 16-30.—The following substances used in warfare are destroyed by  $H_2O$ : Phosgene, practically at once; the same is true of the perchlorate of the ethyl ester of formic acid, dichloroethyl ether and dibromomethyl ether; dibromomethyl sulfide, dichloromethyl sulfide, and dibromoethyl sulfide are rapidly but measurably destroyed; dichloroethyl sulfide and tetrachlorodiethyl sulfide are gradually destroyed; ethylene bis( $\alpha$ -chloroethyl) sulfide, benzyl bromide, xylol bromide and benzyl iodide, are destroyed very slowly; and chloropicrin, iodoacetic ester, and iodoacetone are practically not affected. In the first group acid production can always be demonstrated. Increase in the length of the C chain and increase of acidity by means of S in the mol. increase the stability in  $H_2O$ . **III. Experimental pathology of phosgene poisoning.** E. LAQUEUR AND R. MAGNUS. *Ibid.* 31-179.—Exptl. studies together with clinical observations and autopsy findings give a definite picture of phosgene poisoning. The irritative action of phosgene on the eye and the upper respiratory tract is extremely slight. Gassing in its pure form consists of a local action upon the alveolar walls to which all other important effects are secondary. The action of concd. phosgene causes an acid accumulation in the lung followed by contraction of the bronchial musculature and marked interference with the pulmonary circulation leading to rapid asphyxia. Breathing of dil. phosgene gas mixts. causes stimulation of the delicate vagus nerve endings in the capillaries of the alveoli with an increase in their permeability without affecting their  $O_2$ - $CO_2$  exchange. This results in a rapid filling up of the alveoli with fluid and asphyxia. Stasis, asphyxia and blood changes (acidosis) produce severe functional disturbances in other organs, esp. the kidneys and central nervous system. **IV. Supplementary studies on the pathological anatomy of phosgene poisoning.** OTTO HEITZMANN. *Ibid.* 180-99 (1921).—Anatomical studies have shown that the inhalation of phosgene produces an inflammatory exudate through injury of the alveolar walls in which first serum, then leucocytes pass into the alveoli from the pulmonary capillaries. Red cells do not pass through. The withdrawal of a large amt. of serum from the blood leads to concn. and increased viscosity with slowing of the circulation time. The altered composition of the blood and the passive congestion in the lungs due to the edema weaken the heart, following which there is stasis in other organs. Death follows from asphyxia due to severe pulmonary edema or the edema becomes completely absorbed and all symptoms disappear. **V. Experimental and theoretical principles in the therapy of phosgene poisoning.** E. LAQUEUR AND R. MAGNUS. *Ibid.* 200-90.—Chem. neutralization of inspired phosgene in the air passages before it has caused injury to the alveoli is impracticable because of its rapid destruction. Intravenous injection of dil. Ca salts saves a considerable propor-

tion of animals, probably by decreasing the permeability of the capillary walls. Edema of the lungs (in the rabbit but not in the cat) may be osmotically removed by intravenous injection of concd. sugar solns. One-half the animals which would surely die otherwise, may be saved by this means. Hypertonic NaCl solns. in the cat are extremely harmful. Cardiac stimulants are of value in the treatment of secondary cardiac effects. VI. Chloropierin poisoning. M. GILDEMEISTER AND W. HEUBNER. *Ibid* 291-366.—Chloropierin slowly oxidizes KI to  $I_2$  and hemoglobin to methemoglobin. Locally it is extremely irritating. After injection it first stimulates, then depresses the central nervous system, and produces pulmonary edema and multiple capillary hemorrhages. Inhalation of large doses leads to passive hyperemia in the lungs; in severe cases failure of the ventricle, in less severe cases a functional disturbance manifested by dilatation and slowing of the pulse; parenchymatous degeneration of the liver, kidneys and myocardium. Inhalation of small doses causes an inflammatory edema of the lungs almost identical with that produced by phosgene and a transitory diminution in general catabolism. VII. The pharmacologic action of bis( $\beta$ -chloroethyl) sulfide. FERDINAND FLURY. Wieland. *Ibid* 367-483.—Bis( $\beta$ -chloroethyl) sulfide is a protoplasmic poison and affects all cells with which it comes in contact. Most frequently these are cells which cover surfaces such as the epithelium of the skin, respiratory tract and gastrointestinal tract. Injury of the cells leads to their death; therefore the reaction is not reversible and is easily demonstrable histologically. The necrotizing action is also exerted upon the vessels and consists of capillary injury. The cellular injury is direct and not due to vascular changes. Healing is slow, secondary infections are frequent and serious complications occur. VIII. The pathological changes following poisoning with bis( $\beta$ -chloroethyl) sulfide in animal experiments. OTTO HEITZMAN. Berlin. *Ibid* 484-522.—Histological changes following poisoning with bis( $\beta$ -chloroethyl) sulfide gas or vapor suggest the following conclusions: The most marked changes responsible for the disease picture as a whole follow the primary local effect. The first action is upon the epithelium of the skin, respiratory tract and eyes. In the skin the cells of the epidermis are damaged, following which there is injury to the capillaries with edema, bleb formation and exudation. The poison may gain entrance to the blood through the injured epithelium and capillaries and circulatory injury and damage to internal organs result. Injury to the blood itself and particularly the red blood cells consisting of intravascular destruction is evidenced by hemosiderin deposits in the spleen and liver. The severity of the injury to the skin, respiratory organs and blood corpuscles results in general toxic phenomena manifested by a rapid disappearance of fat from the fat depots, atrophic changes in the heart and liver and deposition of waste pigments. IX. Local action of arsenic compounds. FERDINAND FLURY. *Ibid* 523-78.—Pharmacologic study of several hundred As compds. has shown that a large proportion of them exert a powerful action. Intense cell poisoning is manifested by those that can come in contact with cells either in stable fluid form or as a gas. Plant cells are similarly affected. They differ from strong caustics in that they produce marked inflammatory reactions and necrosis in the lowest concns. No qualitative differences from the substances described in the preceding studies were noted. The irritant action upon sensory nerves exceeds by far that of any known chem. substance. The irritant effect is certainly not due to splitting off of acids or the action of H-ions.

E. B. FINK

Studies on the effects of quinine on the liver, blood cells and urine of rabbits. DAVID M. SUPERSTEIN AND MORRIS LITMAN. Univ. Minn. *Arch. Internat. Med.* 27, 449-56 (1921).—"Quinine hydrochloride, administered intravenously in moderate doses (0.03 to 0.087 g. quinine per kg.) to healthy rabbits, apparently produced the following results: progressive degenerative changes in the liver cells which increase with increasing dosage, a moderate transitory polycythemia rendered persistent by repeated dosage, polyuria."

I. GREENWALD

**The lipoids in the treatment of drug addiction disease.** A. S. HOROVITZ. *Am. Med.* 27, 42-4(1921).—H. believes that drug addiction is caused by the marked decrease or deprivation of lipoids from the system. On the basis of this he developed a mixt. of plant lipoids capable of relieving drug addiction disease in man. Expts. on dogs showed that the administration of the mixt. prevented the acute symptoms usually following withdrawal of morphine. Similar tests on patients were successful.

F. S. HAMMETT

**Tricalcium phosphate as a stimulant for bone reproduction (healing) in fractures.** R. J. BEEHAN. *Med. Record* 99, 850-2(1921).—Expts. are reported on dogs which lead B. to the opinion that when injury to bone is induced and  $\text{Ca}_3(\text{PO}_4)_2$  put in contact therewith there occurs a new bone formation of a type indicating a stimulating action of the added salt. On the basis of this B. has supplied Ca (compd. not stated) directly to fractured bones of man which are not healing properly and has obtained further evidence supporting his idea.

F. S. HAMMETT

**The effect of opium on depressed gastric secretion.** L. JARNO. *Arch. Verdauungs.kranh.* 27, 91-6(1921).—J. reports that he was able to increase the acidity of a markedly hypoacid gastric secretion to normal by the administration of opium. F. S. HAMMETT

**"Peptozone" in diseases of the stomach.** A. BICKEL. *Arch. Verdauungs.kranh.* 27, 104-10(1921).—"Peptozone" is a com. prepn. of 30% Mg peroxide and agar-agar. From expts. on dogs with gastric fistulas it appears that the action of the compd. is both mechanical and chem. in that it stimulates the gastric mucosa mechanically and reduces the acidity of the gastric juice chemically.

F. S. HAMMETT

**The physiological action of some naturally occurring hydroxycoumarins (umhelliferone, daphnetin, esculetin, chrysatroptic acid, and herniarin).** ERNST SIEBURG. *Biochem. Z.* 113, 176-99(1921).—Glucosidic, N-free plant substances of lactone character have been shown to be strongly biologically active. Because of their lactone character the hydroxycoumarins mentioned in the title were studied. Some of these occur in plants in the form of their glucosides. Umhelliferone, esculetin and chrysatroptic acid belong to the special group of fluorescing substances which act as optical desensitizers of erythrocytes. Studies on fishes and the isolated frog heart and blood-pressure expts. on rabbits are reported. The results indicate that there is a coupling of the compds. in the body since only after hydrolysis do the excreted products give the original substances. They have little pharmacol. effect in warm-blooded animals. No specification that could be expected from their lactone character was obtained.

F. S. HAMMETT

**Adrenaline glucemia.** A. BORNSTEIN. *Biochem. Z.* 114, 157-64(1921).—The reaction of the respiratory exchange to adrenaline administration was detd. in several normal and pathological individuals. It was found in general that the drug causes an increase in lung ventilation and consequent decreased alveolar  $\text{CO}_2$  tension with its attendant  $\text{CO}_2$  expulsion from the lungs; the respiratory quotient rises and an increased carbohydrate oxidation ensues. When the breathing mechanism remains uniform the respiratory quotient sinks to normal or below and a marked hyperglucemia occurs. In this case the adrenaline glucemia certainly does not arise from an increased carbohydrate oxidation. Adrenaline also brings about a significant rise in  $\text{O}_2$  consumption.

F. S. HAMMETT

**The so-called oligodynamic action of the heavy metals and their salts.** W. FALTA AND M. RICHTER-QUITTNER. *Biochem. Z.* 115, 39-41(1921).—Studies with Cu, Hg, Ag, Pb, Sn, Zn, Al, Fe, Mg and Pt arranged in the order of their relative so-called oligodynamic activities are very briefly reported. The method of experimentation was to allow the metal to remain in a beaker with  $\text{H}_2\text{O}$  for 8 days. At the end of this period the metal and  $\text{H}_2\text{O}$  were emptied from the container, which was then rinsed with dist.  $\text{H}_2\text{O}$ , and the soln. to be tested was introduced into the supposedly activated vessel.

It was found that a 1% alc. soln. of guaiacum subjected to the action of the substance turned green and later blue-green in a few hours, the color disappearing after a few days, however. A 0.5% soln. of benzidine in 75% alc. was similarly affected. A 1% soln. of resorcinol turned yellow-brown. An aq. 0.2% soln. of homogentisic acid became brown after a few days and then yielded a black ppt.  $\text{KMnO}_4$  was decolorized with formation of  $\text{MnO}_2$ . Methylene blue, indigo blue and Na indigosulfonate were decolorized while a leuco base of malachite green was oxidized to a colored product. All the protein solns. studied were coagulated after a time in contact with the treated containers. In very dil. protein solns., such as albuminous urine, the protein was quant. pptd. out. Blood serum and body fluids containing serum also pptd. their protein. Studies with 1% starch soln. showed that hydrolysis to sugar did not occur under these conditions. But when unglazed porcelain was treated with Hg as described, then reduction of the starch soln. occurred. This reaction did not take place when any of the other metals were used. These reactions are all considered to be typical catalytic phenomena and are due to minute amts. of metallic ions in soln. which were absorbed by the glass.

F. S. HAMMETT

**Illuminating gas poisoning during the war.** I. MÜLLER. *Vierteljahrs. ger. Med.* 61, 1-24(1921).—A marked increase in the number of cases of poisoning by illuminating gas occurred in the service of the Rudolf Virchow-Krankenhaus during the war. Many of these were attempts at suicide. The post-toxic clinical pictures are reported in some detail.

F. S. HAMMETT

**Some methylated amino acids and methylated aporphine alkaloids and their retention in the animal body.** D. ACKERMANN AND F. KUTSCHER. *Z. Biol.* 72, 177-86(1920).—The excretion by lab. animals of *D*-homobetaine, serin-betaine, glutaminic acid betaine, trimethylammonium valerate and caproate, and trimethylphenylethylammonium hydroxide, hexamethyltetramethylenediammonium hydroxide, hexamethylpentamethylenediammonium hydroxide and trimethylimidazoleethylammonium hydroxide was studied. Practically all of the drugs were excreted in part unchanged in the urine; this gives rise to the opinion that in the biological sense methylation in plants and animals is to be looked on as a retardation of further decomposition.

F. S. HAMMETT

**Physiological action of Korean ginseng.** S. WATANABE. *Chuo Igakkai Zasshi*, No. 274, 1225(1918); *Jap. Med. Literature* 6, 11(1921).—From observations on rabbits and on 4 human subjects, it is concluded that Korean ginseng produces diuresis, and increased blood pressure and pulse rate, but does not influence the body temp.

JOSEPH S. HEPBURN

**Some reasons for the symptomatology of drugs.** ALBERT E. HINSDALE. Ohio State Univ. *Hahnemannian Monthly* 56, 241-9(1921).—An explanation of the symptomatology of some 25 chem. compds. and drugs, based on their physiol. action.

JOSEPH S. HEPBURN

**Rate of evaporation of ethyl chloride from oils.** CHARLES BASKERVILLE AND MYRON HIRSH. Coll. of City New York. *J. Ind. Eng. Chem.* 13, 322-3(1921).—Study was made of the rate of evapn. of  $\text{EtCl}$  from its mixts. with refined neutral corn oil at a temp. of 37°. Mixts. containing 25% or more of  $\text{EtCl}$  by vol. boiled vigorously as the temp. was raised to 37°; therefore such mixts. cannot be used for internal (colonic or oral) administration as an anesthetic. Evapn. of the  $\text{EtCl}$  from the mixt. rapidly acquires a definite and fairly fixed speed, which begins when the mixt. has attained a compn. of 13 to 14% by vol. of  $\text{EtCl}$ . The possible use of oil mixed with  $\text{EtCl}$  or with  $\text{EtCl}$  plus  $\text{Et}_2\text{O}$  in medicine and in dentistry is discussed.

JOSEPH S. HEPBURN

**Vasodilator action of sugars, sodium chloride, and urea on the renal and peripheral vessels.** S. KONDO. *Kyoto Igaku Zasshi* 15, No. 1, 17-25(1918); *Jap. Med. Literature* 6, 1(1921).—Dilator action was more marked on the renal than on the peripheral

vessels. The action of a sugar was inversely proportional to its mol. wt. and directly proportional to its osmotic pressure.

JOSEPH S. HEPBURN

**Toxicity of chlorinated methyl carbonates and chlorocarbonates.** ANDRÉ MAYER, H. MAGNE AND L. PLANTÉFOL. *Compt. rend.* 172, 136-9(1921).—The nine possible Cl derivatives of  $\text{CO}(\text{OCH}_3)_2$  obtained by substituting Cl for H, also  $\text{COCl}(\text{OCH}_3)$  and its 3 Cl derivatives (cf. Kling *et. al.*, *C. A.* 14, 738-9, also Grignard, *et al.*, *C. A.* 14, 738-9) are studied with reference to their toxicities. Expts. were made with rabbits, guinea pigs, and in some cases dogs. At least 3 subjects of each species were employed in each test. The animals were made to breathe a measured mixt. of air and toxic vapor for 15 min. If one Me group remained intact the substitution of H by one atom of Cl caused a marked increase in toxicity. Introduction of a second Cl atom increased the toxicity less than the first atom and the addition of a third atom increased the toxicity less than the second. With one Cl in one Me group, the introduction of 2 Cl in the other Me group greatly increased the toxicity; addition of a third Cl atom appeared to increase the toxicity for guinea pigs but not for rabbits. If one Me group contains 2Cl, the introduction of one Cl in the other group does not increase the toxicity for rabbits and diminishes it for guinea pigs. If one Me group contains 3 Cl, toxicity for both animals is diminished by one Cl in the other group but is increased by 2 Cl. Toxicity is increased up to the introduction of 3 Cl. Further introduction of Cl decreases the toxicity if the trichloro deriv. had its Cl in one Me group but toxicity is not changed if 2 Cl is in one group and one Cl in the other. Apparently the less symmetrical the more toxic. The toxicity of  $\text{COCl}(\text{OCH}_3)_2$  increased with the introduction of Cl up to complete substitution of Cl for H. The increase was less for each atom of Cl introduced after the first.

L. W. RIGGS

**Employment of alkaline polysulfides for the neutralization of certain toxic gases.** DESGREZ, GUILLEMERD AND LABAT. *Compt. rend.* 172, 342-4(1921).—While studying the action of polysulfide spray on chloropicrin it was found that the spray was effective in the neutralization of other suffocating gases. It is recommended to make a concd. stock soln. by mixing 240 g. sodic liver of S, 140 cc. soap maker's lye, and water up to 1 liter. This soln. is dild. by adding 10 vols. of water at the time of spraying. Expts. were made to det. the vol. of the dild. spray soln. necessary to purify 20 cu. m. of air containing various toxic agents. The figures ranged from 12 to 24 liters; in the case of 20 cu. m. containing 20 liters Cl and 19 g.  $\text{COCl}_2$ , 36 liters of spray were used. Com. liver of S is variable; the kind recommended contained S as polysulfide 18.24%, anhydrous hyposulfite 4.74, anhydrous sulfate 17.13. The proportion of free S was slight.

L. W. RIGGS

**Modifications produced in the rhythm of inhibition of muscular and of skin tissue by the association of lipoids with stannous solutions.** H. DROVIN. *Compt. rend.* 172, 721-3(1921).—The object of these expts. was to verify the observation that the reinforcement of the therapeutic activity of Sn by the addition of lipoids to stannous solns. was caused by an increase of cellular absorption. Approx. equal wts. of muscle or skin from guinea pigs were immersed in simple stannous solns., phospho-stanno-lipoids, cholestero-stanno-lipoids, and complex-stanno-lipoids. Tests were made with sodium metastannate and with  $\text{SnI}_2$  in aq. solns. contg. 1 mg. Sn per cc. In the other 3 solns. there was added to the Sn 4, 1 and 4 mg. of the resp. lipid. The test tissues were weighed from time to time to det. the rate of imbibition, the time when max. was reached and the subsequent loss. Conclusions: The rhythm of imbibition of both forms of Sn used was modified by the addition of lipoids, in a manner varying with the salt, lipid and tissue. With sodium metastannate the lipoids moderate and regulate the action; with  $\text{SnI}_2$  lipoids reinforce and at the same time regulate the action. Reinforcement is attributed to the phospho-lipoids and moderation and regulation to the cholestero-lipoids. Lipoid complexes in general show a combination of the actions of their components.

The nature of the tissue has but slight effect, but other factors being equal, imbibition by skin is slower and less intense than by muscle tissue. L. W. RIGGS

**Industrial lead poisoning.** MARVIN D. SHRE. *J. Am. Med. Assoc.* 76, 835-42(1921).—This paper gives an extensive account of the occurrence, symptoms, diagnosis, and prophylactic and curative treatments of lead poisoning. Especial emphasis is laid upon instruction of workers exposed to the lead hazard in personal hygiene, and in the cooperation of employers and workmen to promote sanitary conditions. In this study nearly 1000 workers in the lead industries were examd. 175 of them exhibited various degrees of lead poisoning. L. W. RIGGS

**Action of mercurochrome-220 on the gonococcus.** ERNEST O. SWARTZ AND DAVID M. DAVIS. *J. Am. Med. Assoc.* 76, 844-6(1921).—The technic of Davis and Swartz (cf. C. A. 15, 1148) was followed. Conclusions: Mercurochrome-220 shows a powerful germicidal action against the gonococcus, which is about 40 times as susceptible to its action as *B. coli*. Solns. of mercurochrome-220 lose their potency on standing and should be used only when freshly made. L. W. RIGGS

**Effect of phosphorus in rickets.** D. B. PREMISTER, E. M. MILLER AND B. E. BONAR. *J. Am. Med. Assoc.* 76, 850-4(1921).—Several case histories illustrated with röntgenograms taken before and after treatment, are given. It appears to be established that P treatment restores the power of normal ossification in some way not clearly understood. L. W. RIGGS

**Factors relating to the toxic action of arsphenamine.** RUD HUNT. *J. Am. Med. Assoc.* 76, 854-9(1921); cf. following two abstracts. "Three distinct types of toxic action have been observed: (a) preps. the toxicity of which was due to the presence of *m*-amino-*p*-hydroxyphenylarsenous oxide (arsenoxide); (b) preps. the toxicity of which seemed to be due to the presence in the manufd. product of toxic substances other than the above-mentioned oxide; and (c) preps. toxic on account of the physical properties of the soln. or of the presence in them of a very easily destroyed toxic substance." No com. prep. of class (a) was encountered, but such a substance was made in the lab. and produced pronounced symptoms in rats. The presence of some oxidation product of arsphenamine was confirmed by the addition of  $\text{Na}_2\text{S}_2\text{O}_4$  which caused an immediate diminution in the toxicity. In class (b) no toxic compd. has yet been isolated but the probability of its presence is strong. The study reported in this paper was mainly upon preps. of class, (c) the results being assembled in 7 tables, with the following summary: "Some preps. of arsphenamine are very toxic when prepd. at room temp.; the toxicity is greatly reduced by gently warming and in some cases by allowing the solns. to stand for a time at room temp. Cold may preserve the toxicity for long periods. Preps. which, after warming, may be tolerated in doses of 150 mg. per kg. may kill in doses of 60 mg. before warming." Preps. are sometimes encountered the toxicity of which is not diminished by the action of  $\text{Na}_2\text{S}_2\text{O}_4$  or by warming, nor is it due to inorg. As and certain other compds. which have been suggested. L. W. RIGGS

**Elimination and fixation of therapeutic neoarsenicals.** KOHN-ABREST, SICARD AND PARAP. *Compt. rend.* 172, 301-4(1921).—The As compd. was administered intravenously in 10 cases and subcutaneously in 7, the dose ranging from 0.15 to 0.2 g. and the total amt. reaching in some instances over 10 g. during periods of treatment varying from several weeks to about 2 months. The time elapsed between the last dose and death, from various causes, was from 45 min. to 120 days. As was recovered by means of the usual toxicological procedure. The elimination of "neoarsenobenzenes" and other arsenicals injected intravenously was very rapid. The organs from which As was recovered showed increasing amts. in the following order: lungs, intestines, spleen, kidney, liver. The brain usually contained but traces of As; more, however, was found after subcutaneous than after intravenous injection. The presence of As in the brain in amts. of a few mg. indicates intoxication. The total As in ordinary human viscera

is not above 1 mg. When amts. found are 1 to 3 mg., previous therapeutic arsenical treatment is indicated, and in cases of recent treatment As may reach 3 to 7 mg. The presence of centigrams of As in the body points to arsenical poisoning.

L. W. RIGGS

**Prevention of by-effects of neoarsphenamine.** SICARD AND PARAF. *Bull. soc. méd. hôpitaux* 45, 11(1921); *J. Am. Med. Assoc.* 76, 896.—The authors inject 30 cc. physiol. saline soln. containing 0.6 or 0.75 g.  $\text{Na}_2\text{CO}_3$  following through the same needle with the soln. of neoarsphenamine. This protects against the shock as effectually as Besredka's method of preliminary injection of a small amt. of the antigen. Skeptophylaxis is realized.

L. W. RIGGS

**The quinotoxin myth.** TORALD SOLLMANN. *J. Am. Med. Assoc.* 76, 999-1001 (1921).—The name quinotoxin "is incorrect historically, suggests false theories and leads to confusion with another, quite different, substance. It should be abandoned and displaced by the perfectly good name (quinicine) bestowed on it by its original discoverer." The amt. of quinicine or cinchonidine which could be found in the stomach is exceedingly small on account of the short time that quinine or cinchonine remains in the stomach. Contact of quinine with dil. org. acids at ordinary temp. gave only traces of quinicine after 2 days. Toxicity of both quinicine and cinchonidine is low, perhaps about 15 and 10 mg., resp., per kg. Preps. contg. quinine and org. acids may form traces of quinicine on standing but the quinicine thus formed would undergo further transformation into inactive products. Such preps. should not be used after they become pptd. or discolored, not because they are toxic but because they are inactive.

L. W. RIGGS

**Protein therapy.** FERNAND WIDAL, PIERRE ABRAMI AND ETTENNE BRISAUD. *Presse méd.* 29, 181-8(1921).—A complete review of the literature and of the expts. of the authors.

H. A. SHONLE

**Adsorption of poisons by components of the animal body.** I. Cocaine with serum or brain tissue. W. STORM VAN LEEUWEN. *Arch. exp. Path. Pharm.* 88, 287-303 (1920).—The activity of cocaine can be checked by contact with human, dog, rabbit, or guinea pig sera, with rabbit or cat brain tissue, with an ethereal ext. of dried cat brain, or with lecithin. This loss in potency is not associated with any chem. union but is rather a physical adsorption.

G. H. SMITH

**Altering experimentally the susceptibility of various animals and surviving organs to poisons.** W. STORM VAN LEEUWEN AND C. VAN DEN BROEKE. *Arch. exp. Path. Pharm.* 88, 304-17(1920); *Proc. Acad. Sci. Amsterdam* 22, 913-26(1920).—The sera of various animals contain substances which are able to intensify the action of various alkaloids (in this study, pilocarpine) upon the surviving intestine. Cholesterol and cerebrin also possess this power, lecithin shows a questionable action, and peptone is very strongly active although dialysates of peptone are without action. The intestine of the cat was treated with pilocarpine, and with a mixt. of pilocarpine and rabbit serum. The latter gave the most marked contraction. Cholesterol also increased the response, not only when added mixed with serum but also when the tissue was first treated with cholesterol and then washed and later treated with pilocarpine. Both cholesterol and heterologous rabbit serum exert a sensitizing action. Lecithin was inconstant in its effect, sometimes augmenting, sometimes decreasing the susceptibility to pilocarpine. Cerebrin intensified the action somewhat, as did peptone to a marked degree. Dialysates of peptone decreased sensitiveness.

G. H. SMITH

**Altering experimentally the susceptibility of various animals and surviving organs to poisons.** W. STORM VAN LEEUWEN AND M. V. D. MADE. *Arch. exp. Path. Pharm.* 88, 318-32(1920); *Proc. Acad. Sci. Amsterdam* 22, 927-42(1920).—When injected intravenously into cats the effect of adrenaline upon blood pressure is not detd. solely by the size of the dose, the rapidity of injection, or the susceptibility of the reacting



organ, but is in some degree associated with the presence in the serum of the animal of substances which augment the action of the drug. The susceptibility of certain animals, apparently deficient in these substances, can be enhanced by an injection of human or cat serum. Other animals possess an adequate amount of this substance but even in them an injection of Witte peptone or peptone dialysates will strengthen the action. As a rule rabbit sera possesses so much of this substance that peptone will not add to the reactivity.

G. H. SMITH

**Action of *d*-, *l*-, and *i*-camphor on the smooth muscle of the leech.** GEORG JOACHIMOGLU. *Arch. exp. Path. Pharm.* 88, 364-70(1920).—The three isomers of camphor act the same qual. and quant. The effect of camphor is increased by Ba.

G. H. SMITH

**Specific action of bromine salts.** ERNST OPPENHEIMER. *Arch. exp. Path. Pharm.* 89, 29-45(1921).—Rats and guinea pigs were intoxicated by the subcutaneous injection of NaBr, and the amt. of benzene-sol. Br in the various organs was detd. The amts. found paralleled the content of the tissues in fat-like, lipid materials. Apparently the benzene-insol. NaBr, if it comes into intimate contact with lipids, is transformed into a form which may be detected as benzene-sol. Br. This alteration is probably a colloidal change rather than a strictly chem. process. These observations suggest that Br may have a specific pharmacol. action associated with this process.

G. H. S.

**Detoxication by adsorptive displacement.** HERMANN WIELAND. *Arch. exp. Path. Pharm.* 89, 46-65(1921).—The detoxication of the heart poisoned by desoxycholate by such agencies as serum, Na oleate, ether, xylene, camphor, and animal charcoal is an adsorption phenomenon. Because of their surface activities these substances in proper concns. are adsorbed by the surface of the heart and they displace the adsorbed desoxycholate. Other surface intoxicating substances—chloral hydrate, strophanthine, yohimbine—can be dissociated from the heart by camphor or other agents. Camphor owes its therapeutic effect on the heart to this adsorptive displacement.

G. H. S.

**Physiology and pharmacology of fibrillar connective tissue.** E. FRIEDBERG. *Arch. exp. Path. Pharm.* 89, 66-105(1921).—The material for testing was derived from the rat tail. When suspended in Ringer soln. the tendon has a tension capacity of 1 kg. per sq. mm., a high value of extensibility, and a tensile strength of 3.5-5 kg. per sq. mm. When dried the tensile strength is greatly increased, and the extensibility diminished. Changes due to thermic effects occur early (at 30 degrees) and are manifested by decreased elasticity and tensile strength; these changes are apparently associated with alterations in the collagens. Independent of this is the so-called thermic shortening, which takes place at about 65°. Prolonged immersion in Ringer soln. is attended by gradual and continuous impairment of function. In hypotonic solns. absorption of water occurs with injury to function and a true swelling process. In distd. water the morphologic changes which occur are slight and are detected only by microscopic examn.; the physiol. changes are concerned chiefly with elasticity. Hypertonic solns. have a more pronounced effect, and with NaCl solns. the amt. of change increases with the concn. of the salt. Acids have a marked effect, the mineral acids being most active: HCl 1:30,000, acetic acid 1:4,000, salicylic acid 1:10,000. Alkalies also interfere with function, the strength of effect going parallel with degree of alkalinity. Of the neutral salts, KCl had no effect as far as function was concerned; CaCl<sub>2</sub> (5%) caused a marked extension with impairment of elasticity, increasing with duration of treatment; thiocyanogen salts had similar effects, the Na salt being weaker, the K salt stronger than the Ca salts. Fibrinolysin showed no effect, although it is active within the body.

G. H. S.

**Synergism of atropine and blood serum on the frog heart poisoned by muscarine.**

HANS KIRSTE. *Arch. exp. Path. Pharm.* 89, 106-10(1921).—Atropine dild. in Ringer soln. and mixed with human or rabbit serum was used in the treatment of muscarine-poisoned hearts. Serum is just as capable as atropine of abolishing the muscarine action; usually a serum dild. 1:15 with Ringer soln. was efficient. When atropine was dild. in serum its effect was intensified; in certain relative concns. it was 200 times as active as when dild. in Ringer soln. The serum effect was not related to species, to age (20 min. to 4 days after coagulation tested), nor was it impaired by heating to 56° for 1 hr., but adsorption of the serum with animal charcoal completely annulled its action. The loss in activity was shown to be due to an adsorption of Ca by the charcoal (treatment of Ringer soln. had the same effect), although a replacement of Ca did not restore the activity completely. G. H. S.

Colloidal arsenic. FRITZ KÜTZ. *Arch. exp. Path. Pharm.* 89, 111-43(1921).—The chem. and physical properties of the preps. of colloidal As are given in detail. The compds., which were very well protected and practically free of  $As_2O_3$ , were tested upon frogs and rabbits. The pharmacol. action of elementary As was not observed to any marked degree with the compds., and was only manifest when oxidation had occurred. The picture of intoxication with colloidal As corresponded essentially with that of  $As_2O_3$  intoxication. In the blood, colloidal As, like  $As_2O_3$ , leads to a transitory concn. of the blood, associated with an increase in the number of erythrocytes. Small amts. caused only very irregular changes but large doses (16 mg. per kg. and higher) induced marked alterations. In contrast to  $As_2O_3$  the colloid did not cause anemia, although the latter compd. had a more marked effect upon the leucocytic elements. A primary leucopenia was followed by  $\alpha$  hyperleucocytosis, the degree and duration of which depended upon the dosage. Of the white cells the pseudoeosinophils were always concerned, and to the most marked degree; 3 hrs. after injection of the colloid they amounted to but 6.4% of the original count, 22 hrs. after they had increased to 360 %. Fluctuations in the lymphocyte count were less pronounced and the eosinophils were essentially unchanged. At the height of the leucocytosis (24-30 hrs. after injection) nucleated red cells and myelocytes appeared. Karyorrhexis, and pyknosis in the circulating blood was observed. Colloidal As was as effective as  $As_2O_3$  in the treatment of mice infected with *Trypanosoma brucei*, *Trypanosoma equiperdum* and *Spirocheta recurrentis*. G. H. S.

Significance of the components of Ringer solution upon the vascular irritability of surviving organs. ALBERT K. E. SCHMIDT. *Arch. exp. Path. Pharm.* 89, 144-70(1921).—The addition of  $CaCl_2$  to Ringer soln. usually caused relaxation with dilatation of the vessel walls, and associated with this action of increased Ca ions the susceptibility of the vaso-constricting mechanism to adrenaline was decreased. Faradic stimulation was likewise less effective, although the constricting action of Ba salts was not impaired. When the NaCl and KCl was increased vaso-constriction resulted. An increase in Na ions increased adrenaline susceptibility; excess of K ions decreased it. Incidentally it was noted that the addition of Mg salts dilated the vessels, but the action of adrenaline upon such vessels was but slightly modified. Li salts acted as KCl but less strongly. The strongest influence upon vasomotor irritability and adrenaline susceptibility was exerted by the OH-ion content. Herein lies the significance of the  $NaHCO_3$  in the soln. The carbonate can be replaced by an appropriate amt. of NaOH. The presence of OH-ions does not, however, greatly modify the action of Ba salts. G. H. S.

Change in the action of adrenaline after stimulation of the vagal endings. RICHARD KOLM AND ERNST P. PICK. *Arch. ges. Physiol.* 184, 79-102(1920).—Previous treatment of the frog heart with acetylcholine, pituitrin, muscarine, or neurine, so alters its activity that amts. of adrenaline without effect upon the non-intoxicated heart produce a diastolic arrest. Atropine removed this type of reaction. The constrictor action of acetylcholine upon the blood vessels is removed by atropine, but it is not

influenced by nicotine paralysis of the peripheral ganglia. Perfusion with acetylcholine followed by treatment with adrenaline is not accompanied by vaso-constriction; if anything vaso-dilation occurs; but when the two drugs are mixed a mutual antagonism is exhibited. The effect of adrenaline upon plain muscle in the presence of acetylcholine is not inhibitory but is possibly stimulating. Atropine prevents this action. The vagotropic action of adrenaline upon the heart, vessels, and gastro-intestinal tract is ascribed to an association between the vagal and sympathetic systems; extreme stimulation of the vagus results in reduced reactivity of the sympathetic endings. G. H. S.

**Inverse adrenaline action.** C. AMSLER. *Arch. ges. Physiol.* 185, 86-92(1920).—After exposure of the ventricle of the frog heart to nicotine, or after treatment with ergotamine, adrenaline acts inversely. G. H. SMITH

**Action of splenic extract (lienin) on the frog heart in situ and on the isolated perfused mammalian heart.** E. ROTHLIN. *Arch. ges. Physiol.* 185, 111-21(1920).—Lienin, the active principle of splenic ext., exerts a two-fold action on the heart. Upon that of the frog a primary phase consisting of decrease in muscular tone, retardation of beat, and reduction in amplitude of contraction is followed by a second phase characterized by decrease in frequency of pulsation and strengthening of the amplitude of contraction. During this phase the muscle tonus is slowly restored. In the mammalian heart an abrupt increase in tonus is associated with a simultaneous loss in frequency and amplitude. As in the case of the frog, this phase persists for only 10-15 sec. Both the frequency and strength of contraction are restored in the second phase. Lienin resembles  $\beta$ -imidazolyethylamine and pituglandol qual. in its action on the heart, although quant.  $\beta$ -imidazolyethylamine is much more potent. It is suggested that in both lienin and pituglandol the active substance may be  $\beta$ -imidazolyethylamine. G. H. SMITH

**Effect of adrenaline on secretion of gastric juice.** W. R. HESS AND R. GRUNDLACH. *Arch. ges. Physiol.* 185, 122-36(1920).—The secretion of gastric juice is inhibited by the intravenous or intramuscular injection of adrenaline. This action is manifested without regard to the phase of secretory activity obtaining. The intensity of its action is proportional to the amt. given and the effects persist for 15 min. after intravenous injection, or for at least 200 min. after an intramuscular injection. G. H. SMITH

**Effect of hypophysis extract on secretion of gastric juice.** W. R. HESS AND R. GRUNDLACH. *Arch. ges. Physiol.* 185, 137-40(1920).—The intravenous or intramuscular injection of hypophysis ext. causes a transitory depression in the secretion of gastric juice. G. H. SMITH

**Pharmacology of lipoids. I. Experiments on red blood cells.** ADOLF JARISCH. *Arch. ges. Physiol.* 186, 299-317(1921).—By the treatment of red blood cells with emulsions of substances secured by the alc. and ether extn. of animal organs, or by exposure of the cells to narcotics in small amts., or to minute amts. of soaps, they become markedly resistant to the lytic action of hypotonic saline solns. At the same time, their resistance to acid, alk.,  $HgCl_2$ , desoxycholic acid, heat, freezing, and to some degree to saponin also, is reduced. The increase in resistance induced by narcotics is due to the fact that these substances infiltrate the cells and decrease the capacity for water absorption—an activity analogous to that possessed by lipoids. Sensitization to the other hemolytic agents is a synergistic phenomenon. G. H. S.

**Action of atropine on the eyes of infants.** SIMON EHRENREICH AND MARGOT RIESENFELD. *Z. Kinderheilk.* 28, 55-8(1921).—Solns. of 1:1000 to 1:20,000 are always effective in causing dilatation of the pupil. In 63% of the cases a fresh soln. 1:50,000 was active and in 76% 1:500,000 caused mydriasis. G. H. S.

**Therapeutic action of N-phenylglycineamide-p-arsonic acid (tryparsamide) upon experimental-infections by Trypanosoma rhodesiense.** LOUISE PEARCE AND WADE H. BROWN. Rockefeller Inst. for Med. Research. *J. Exp. Med.* 33, 193-200(1921).—The trypanocidal action of tryparsamide was found to be much less for *Tr. rhodesiense*

than for *Tr. gambiense* and a correspondingly greater difficulty was experienced in the treatment of the chronic tissue infections of *Tr. rhodesiense*. C. J. WESS

**Quantitative distribution of particulate material (manganese dioxide) administered intravenously to the dog, rabbit, guinea pig, rat, chicken, and turtle.** CHARLES C. LUND, LOUIS A. SHAW AND CHCII, K. DRINKER. Harvard Med. School. *J. Exp. Med.* 33, 231-8(1921).—The distribution of  $MnO_2$  1 hr. following intravenous injection is remarkably const. for all the animals tested, except the cat, in which the injected material is practically equally divided between the lungs and liver. In the other animals the liver performs the main share of the work, and in the cat it has been shown that the liver after 12 hours accumulates the Mn which was formerly deposited in the lungs.

C. J. WESS

**Condition of the capillaries on histamine shock.** ARNOLD RICH RICH. Johns Hopkins Univ. *J. Exp. Med.* 33, 287-298(1921).—Histamine exerts a local dilator effect upon capillaries and upon the smallest arterioles and venules which border the capillary system. There occurs also an opening up of a large number of capillaries of which no trace can be seen before the application of histamine. When injected intravenously in amts. sufficient to produce shock, histamine causes a quickly progressive dilatation of both the visible and the occult capillaries and of their immediately adjacent arterioles and venules, all of which become engorged with blood that moves through them in a strikingly sluggish manner. The circulatory failure which characterizes histamine shock results from dilatation of the peripheral vascular bed. C. J. WESS

**Action of adrenaline on the heart. III. The modification of the action of adrenaline by chloroform.** W. J. R. HEINKEAMP. Univ. of Ill. *J. Pharmacol.* 16, 247-57(1920); cf. *C. A.* 14, 1164.— $CHCl_3$  is toxic for heart muscle, producing or tending to produce weakening of the organ. Inhibition under  $CHCl_3$  anesthesia after adrenaline is due primarily to the toxic or paralytic dilatation of the heart. Because of the action of  $CHCl_3$  on the heart, adrenaline is contraindicated whenever  $CHCl_3$  is employed and  $CHCl_3$  wherever adrenaline is used. The adrenaline action is peripheral since it occurs after section of the vagi. C. J. WESS

**The toxicity and skin irritant effect of certain derivatives of dichloroethyl sulfide.** E. K. MARSHALL, JR., AND JOHN W. WILLIAMS. Washington Univ. *J. Pharmacol.* 16, 259-72(1920).—The following values were found for the minimum lethal doses for mice (per kg. body wt.): dichloroethyl sulfide, 125 mg.; bis-( $\beta$ -chloroethyl) sulfoxide, 125; sulfone, 105; bis-( $\beta$ -iodoethyl) sulfoxide, 150; sulfone, 30; bis-( $\beta$ -thioethyl acetate), >850;  $\beta$ -bromoethylthiyl sulfide, 490; bis-( $\beta$ -ethylmercapto ethyl) sulfide, >650; sulfone, 175; bis-( $\beta$ -propylmercapto ethyl) sulfone, 300; bis-( $\beta$ -butylmercapto ethyl) sulfone, 400; bis-( $\beta$ -isobutylmercapto ethyl) sulfone, 500; bis-( $\beta$ -phenoxyethyl) sulfide, >550; sulfone, >500; bis-( $\beta$ -phenylmercapto ethyl) sulfide, >600; 4-phenyl-1, 4-sulfonazan, >650; 4-*p*-cresyl-1, 4-sulfonazan, >450. The skin irritant effect of these compounds has been examined on man. Dichloroethyl sulfone is of the same order of activity as the sulfide, while the sulfoxide is practically inert. The former hydrolyzes readily in weak alkali, while the latter does not. Practically no antiseptic action was apparent for any of the compds. with the exception of dichloroethyl sulfone and diiodoethyl sulfone. The sulfones are many times more toxic for bacteria than the sulfoxides. The toxicity of dichloroethyl sulfoxide and the sulfone, while of the same order of magnitude for mice, is markedly different for unicellular organisms, the latter being 100 times more toxic than the former. The solubilities and partition coeffs. with  $H_2O-C_2H_5$  have been studied for certain of these derivs. The evidence obtained in this study is not in disagreement with the theory of intracellular acid production previously proposed to explain the action of mustard gas. C. J. WESS

**Effect of carminative volatile oils on the muscular movements of the intestine.** O. H. PLANT. Univ. of Penn. *J. Pharmacol.* 16, 311-25(1920).—Carminative volatile oils

increase the muscular movements in the intestine when applied to the mucous membrane in dil. soln. in unanesthetized dogs. These effects are lessened but not abolished by atropine. When the muscular activities of the intestine are markedly increased by the injection of small doses of morphine in dogs, the same kind of effect is produced by the volatile oils as before the morphine was injected. C. J. WEST

**Action of caffeine, theobromine and theophylline on the mammalian and batrachian heart.** REGINALD ST. A. HEATHCOTE. Oxford. *J. Pharmacol.* 16, 327-44(1920).—All three have an active vaso-dilator action on the coronary vessels, probably muscular in origin, caffeine being the weakest and theobromine the strongest. Exptl. evidence is thus provided for the use of theobromine in those conditions such as angina pectoris in which coronary vaso-dilation may be of service. C. J. WEST

**Anesthetic and convulsant effects of gasoline vapors.** HOWARD W. HAGGARD. Yale Univ. *J. Pharmacol.* 16, 401-4(1920).—In general, gasoline vapor has an anesthetic action somewhat like that of  $\text{Et}_2\text{O}$  but with marked convulsant effects due doubtless to irritation of the cerebral cortex. Thus the stage of excitement, common in ether anesthesia, is marked by convulsions under gasoline vapor. The stage of full anesthesia, between consciousness and death, is very narrow. The toxicity of a given amount of gasoline vapor is vastly less than that of the CO produced by its incomplete combustion in an engine. C. J. WEST

**Further studies on the antagonistic action of epinephrine to certain drugs upon the tonus and tonus waves in the terrapin auricles.** CHARLES M. GRUBER. Univ. of Colorado. *J. Pharmacol.* 16, 405-13(1921).—Nicotine in 0.1 to 1% soln. causes an increase in the general tonus and tonus waves. In small doses (0.03 to 0.05 %) there is no increase in general tonus or tonus waves but increased height of contractions. Adrenaline chloride in strong solns. antagonizes the action of nicotine upon the terrapin auricles. Digitalis in solns. from 0.3 to 0.5% causes increased tonus and tonus waves which are also antagonized by adrenaline chloride. The same is true of  $\text{BaCl}_2$  though the general tonus is not effected to the same extent. C. J. WEST

**Absorption from the peritoneal cavity.** A. J. CLARK. Univ. College, London. *J. Pharmacol.* 16, 415-33(1921).—When isotonic solns. of different salts are injected intraperitoneally into rabbits, the rate of absorption of both  $\text{H}_2\text{O}$  and solute in the different solns. is in the following order:  $\text{NaNO}_3$ ,  $\text{NaI} > \text{AcONa}$ ,  $\text{NaCl} > \text{Na}_2\text{HPO}_4 + \text{NaH}_2\text{PO}_4$ ,  $\text{Na}_2\text{SO}_4 > \text{glucose}$ . In the case of solns. of  $\text{NaCl}$  and glucose, the rate of both  $\text{H}_2\text{O}$  and solute is increased by the presence of  $\text{NaF}$ . The rate of absorption of  $\text{H}_2\text{O}$  from a soln. of  $\text{NaCl}$  is increased when the temp. of the fluid injected is raised to  $45^\circ$ . The rate of absorption of both  $\text{H}_2\text{O}$  and salt is diminished when the temp. is reduced to  $25^\circ$ . Epinine slightly increases the rate of absorption of  $\text{H}_2\text{O}$  from solns. of  $\text{NaCl}$  and glucose. When fluid that has been in the peritoneal cavity of a rabbit for an hour is taken out and injected into a second animal, the rate of absorption of both salt and  $\text{H}_2\text{O}$  is slower in the 2nd than in the 1st animal. The rate of absorption of solns. of both  $\text{NaCl}$  and glucose diminishes after the 1st. hr. When a soln. of glucose is injected intraperitoneally about 75% of the glucose is absorbed in 3 hrs., but none of the  $\text{H}_2\text{O}$  is absorbed and usually a larger vol. of fluid is removed than was injected. The variations in the rate of absorption may be due to variations in the ratio between the rate of diffusion of the substances in the peritoneal fluid and the rate of diffusion of the substances in the tissue fluids or the blood. C. J. WEST

**Absorption of local anesthetics through the genito-urinary organs.** DAVID I. MACHT. Johns Hopkins Univ. *J. Pharmacol.* 16, 435-48(1921).—The local anesthetics, cocaine, alypin and apotbesin, are more or less readily absorbed through the urethra, uterers, pelvis of the kidney, prepuce and vagina. While they are readily and rapidly absorbed from the urethra, they are very poorly absorbed from the urinary bladder. C. J. WEST

**Quantitative studies in chemotherapy. IV. The relative therapeutic value of arsphenamine and neoarsphenamine of different manufacture.** CARL VOGTLIN AND HOMER W. SMITH. Hyg. Lab., U. S. Public Health Service. *J. Pharmacol.* 16, 449-61(1921); cf. *C. A.* 15, 123.—Six different brands of arsphenamine have shown approx. the same trypanocidal activity. Slightly greater variations were observed with 6 samples of neoarsphenamine, the max. difference being 80%. There appears to be no relation between toxicity and trypanocidal action of these drugs. It is suggested that the alleged greater effectiveness of arsphenamine over neoarsphenamine in the treatment of human syphilis may be attributed to the fact that arsphenamine is pptd. at the  $\text{OH}^-$  concn. of the blood, in consequence of which the rate of oxidation and elimination from the body is considerably diminished. The study of the trypanocidal action of some aliphatic arsenicals has confirmed the fundamental principle formulated from the previous study of the aromatic arsenicals, *vis.*, that the trivalent oxides are the only forms of As which exert a direct toxic action upon protoplasm. Cacodylic acid does not possess any trypanocidal action even in lethal doses. Me and Et arsenic acids show a parasitocidal action only when used in doses approaching the lethal dose.

C. J. WEST

**Effect of morphine upon the alkali reserve of the blood of man and certain animals.** HARRY GAUSS. Denver, Colo. *J. Pharmacol.* 16, 475-84(1921).—Morphine, administered subcutaneously in the form of sulfate to rabbits, dogs and sheep distinctly increased the alkali reserve of the blood plasma of these animals. There is also a slight but distinct effect upon the  $P_{\text{H}}$  of the blood plasma. Excitement in dogs and rabbits decreased the alkali reserve of the blood plasma. The natural alkali reserve of the plasma of the lamb is distinctly lower than that of sheep but morphine increases it in both animals. Repeated short interval injections of morphine do not tend to have a greater effect than a single injection. In man a therapeutic or slightly toxic dose of morphine did not have a marked effect, when administered subcutaneously, upon the  $P_{\text{H}}$  or the alkali reserve of the blood plasma.

C. J. WEST

**Action of the "emmenagogue oils" on the human uterus.** J. W. C. GUNN. Univ. of Cape Town. *J. Pharmacol.* 16, 485-9(1921).—The "emmenagogue oils" have no stimulant action on the human uterus and Fallopian tubes. In large doses they cause relaxation and inhibition of movement. These oils are: juniper, pennyroyal, rue, savin and tansy.

C. J. WEST

**Influence of colloids on the action of non-colloidal drugs.** I. W. STORM VAN LEEUWEN. Univ. of Leiden. *J. Pharmacol.* 17, 1-20(1921).—Rahhit serum contains substances which are able to inhibit the physiol. action of pilocarpine. Arguments are presented in favor of the assumption that the relative insensitiveness of this animal for pilocarpine is due—at least in part—to the presence of these substances in its serum and in its tissues. The inhibiting power of these substances does not depend upon a chem. destruction of the pilocarpine but on a physical adsorption of the drug. II. W. STORM VAN LEEUWEN and J. ZEIJNER. *Ibid* 127-7.—The same assumptions, made for pilocarpine above, hold for atropine.

C. J. WEST

**Effect of some antipyretics on the behavior of rats in the circular maze.** D. I. MACHT AND WM. BLOOM. Johns Hopkins Univ. *J. Pharmacol.* 17, 21-40(1921).—The various antipyretics studied depressed the behavior and the memory habit of the rats, antipyrine and pyramidone being the most powerful in this respect. Combinations of various antipyretics produced less depression than the individual components when given alone. Even after very large doses, the animals eventually regained their normal activity.

C. J. WEST

**Optical isomers. VII. Hyoscines and hyoscyamines.** ARTHUR R. CUSHNY. Univ. Edinburgh. *J. Pharmacol.* 17, 41-61(1921); cf. *C. A.* 14, 222.—*d*-Hyoscine is 15-18 times as powerful as the *d*-form in action on the termination of the nerves in the

salivary glands and in other "specific" atropine effects. *d*-Hyosine *d*-hyoscyamine is more slowly destroyed in the tissues than the *l*-form. The action of the hyoscines on the nerve ends in striated muscle, on unstriated muscle and on the central nervous system is identical. Similar results were obtained on comparing the 2 hyoscines, except that the *d*-isomer possesses a late stimulant effect on the spinal cord, which may be ascribed to the presence of some decompn. product rather than to the alkaloid itself. It is suggested that the "specific" effects of the atropine group arise from the physical properties of some chem. compound formed with an optically active substance in the tissues, while the less specific effects may be explained by the properties of the uncombined alkaloid.

C. J. WEST

**Magnesium sulfate in arsenic poisoning.** OLGA S. HANSEN. Univ. Minnesota. *J. Pharmacol.* 17, 105-13(1921).—Definite conclusions cannot be drawn in regard to action of  $MgSO_4$  in As poisoning but results may be summarized as follows:  $MgSO_4$  has prolonged the average life of a series of 50 rabbits poisoned by As from 219 hrs. to 415 hrs. on the average, but cannot be said to have saved life in rabbits.  $MgSO_4$  is toxic in large doses and to some extent in medium sized doses. There is a marked variation in individual susceptibility to As poisoning.

C. J. WEST

**Comparison of the action of certain drugs upon muscular work in frogs.** ELEANOR M. SCARBOROUGH. Univ. of London. *J. Pharmacol.* 17, 129-39(1921).—The action of a drug on striated muscle is shown more conclusively by comparison with previous conditions in the same muscle than by the use of 2 corresponding muscles, since these are not necessarily equally responsive. The direct action of alc. and veratrine on frog muscle is to increase temporarily the amt. of work done. Cocaine directly depresses striated muscle without any preliminary increase in response. On muscle which is becoming fatigued, caffeine has very slight restorative action, although an obvious increase in excitability occurs in unfatigued muscle.

C. J. WEST

**Action of histamine and peptone on the isolated small intestine.** HERBERT OLIVER-CRONA. Johns Hopkins Univ. *J. Pharmacol.* 17, 141-67(1921).—Histamine in sufficiently large doses has a paralyzing effect on isolated strips of the cat's small intestine. The complete inhibition of the rabbit's small intestine is obtained with approx. the same concns. of histamine as for the cat's intestine. The minimum concn. of peptone which had a distinct stimulating effect upon the cat's intestine was found to be about 1:75,000. The minimum stimulating concn. of histamine lies well above 1:750,000. The paralyzing concns. lie much closer together (histamine, 1:500, peptone, 1:200). When tested on the rabbit's intestine, the curves of action of histamine and peptone run more closely parallel than in the case of the cat's. The min. concns. were: histamine, 1:75,000; peptone, 1:2500. To obtain complete inhibition, concns. of 1:700 and 1:85 were necessary.

C. J. WEST

Arsenobenzenes, their composition and toxicity (DEMYTTERNAERE, *et. al.*) 17.

## I—ZOOLOGY

R. A. GORTNER

**Further observations on the pigment changes following removal of the epithelial hypophysis and the pineal gland in the frog tadpole.** W. J. ATWELL. *Endocrinology* 5, 221-32(1921).—The silvery tadpole resulting from the removal of the epithelial hypophysis is light-colored because of the condition of its melanophores, and lustrous because of the condition of its xantholeucopores. The light color is due to the fact that the deep melanophores are contracted and the epidermal melanophores and free melanin are reduced in amt. The metallic silvery appearance is due to a wide expansion of the xantholeucopores. When exts. of the posterior lobe of the hypophysis are fed to such animals there is a temporary darkening, which is due to the expansion of the deep melanophores; this is sometimes accompanied by a slight but incomplete

contraction of the xantholeucopores. The epidermal melanin is not restored. When only the pineal gland is removed no change of pigment is observed in the tadpoles, nor does it prevent the silvery reaction characteristic for the removal of the epithelial hyphysis alone.

F. S. HAMMETT

Study of humoral immunity in insects. A. PAILLOT. *Compt. rend.* 172, 546-8 (1921).—If blood of the caterpillar of *Agrotis* is taken aseptically and abundantly inoculated with *B. melonihæ nonliquefaciens*  $\gamma$ , and allowed to stand at 24° in an open tube, the bacteria do not undergo any granular transformation even after a long period in the thermostat. They develop abnormally, showing a longer and thinner form than the typical. If this infected blood is inoculated in the general cavity of a new caterpillar the bacteria rapidly undergo granular transformation, followed directly by bacteriolysis. The reaction is of the same type as that observed on the blood of caterpillars in a state of immunity following inoculation with bacteria of culture. These facts support the hypothesis suggested by P. in a previous paper (cf. *C. A.* 14, 1129).

L. W. RIGGS

Action of concentrated sulfuric acid on the eggs of *Bombyx mori*. A. LÉCALLON. *Compt. rend.* 172, 718-21 (1921).—Nonfertilized eggs immersed in concd.  $H_2SO_4$  1 to 2 min., then washed in distd. water 2 min., lose their yellow coloration. This is observed in eggs either freshly laid or 20 to 25 days old. The aptitude for parthenogenesis persists in these eggs for a long period. Under the conditions of concn., temp., and time in which  $H_2SO_4$  acts on nonfertilized eggs, it is without action on fertilized eggs. Eggs immersed in  $H_2SO_4$  undergo a modification of the structure of the chorion in which it becomes more opaque. It is not proved, that traces of  $H_2SO_4$  have not been able to penetrate into the vitellus and there play a role analogous to that of catalyzers.

L. W. RIGGS

Chemotactic reactions of the flagella "Chilomonas." E. FERNANDEZ GALIANO. *Compt. rend.* 172, 776-9 (1921).—G.'s study was largely a repetition and discussion of the work of Garrey (cf. *Am. J. Physiol.* 3) and of Jennings and Moore (cf. *Ibid.* 6). Whether the protozoa are treated by very dil. acid or by water, provided that in each case as the liquid is added from the pipet the time between the drops is sufficiently long (e. g., 30 sec.), the reaction shows 3 stages: (1) a phase of recoil of the protozoa on contact with the liquid; (2) assembling of the protozoa in the form of a ring around the introduced drop; (3) accumulation of flagella in the interior of the ring.

L. W. RIGGS

Ameboid movement, tissue formation and consistency of protoplasm. LEO LOEB. *Science* 53, 261-2 (1921).—A continuation of previous expts. in these subjects "showed that in the blood cells of *Limulus* it is possible to produce graded variations in the character of the pseudopods and ameboid movements through graded changes in the osmotic pressure of the surrounding medium." Greatly increased fluidity of the protoplasm was produced by the use of a slightly hypotonic soln. of KCl. In this case the change in consistency was so marked that it affected not only the ectoplasmic layer of the cell but extended to the whole of the granuloplasm. The remarkable resulting movements of the whole cell which followed take place only at a temp. sufficiently high. They do not occur in cells kept at 10°. Blood cells exposed to a temp. of 40-42° for a short period show in their periphery the appearance of multiple drops into which the granuloplasm moves subsequently as it does into typical pseudopods. Through changes in the consistency of the protoplasm in the blood cells of *Limulus* it is possible to imitate structures corresponding to different tissues such as those composed of ganglia and glia cells.

L. W. RIGGS



## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

The supplementing of food investigation by systematic feeding experiments. HANS ARON AND RICHARD GRALKA. Breslau. *Chem. Ztg.* 45, 245-7(1921).—A discussion of the use of biological, as a supplement to chem. methods for the valuation of food.

H. A. LEPPER.

Tentative methods of analysis of the American Association of Cereal Chemists. ANON. *J. Am. Assoc. Cereal Chem.* 5, No. 2, 16-7(1920).—Methods for alc.-sol. proteins (gliadin), glutenin, cold-H<sub>2</sub>O-sol. ext., and pentosans are given. H. A. LEPPER

Official methods of analysis of the American Association of Cereal Chemists. ANON. *J. Am. Assoc. Cereal Chem.* 5, No. 2, 15-6(1920).—Methods for H<sub>2</sub>O, ash, protein, crude fiber, and acidity are given. H. A. LEPPER

Methods of analysis—cereal products—wheat flour. C. B. MORISON. Am. Inst. Baking, *Bull.* 2, 35 pp.(1921).—The results of collaborators by methods chosen by them for the detn. of H<sub>2</sub>O, ash, protein and gluten in wheat flour are reported and discussed. H. A. LEPPER

The proteoclastic enzymes in flour and action of enzymes in bread making. H. E. WEAVER AND J. C. WOON. *J. Am. Assoc. Cereal Chem.* 5, No. 2, 6-11(1920).—Proteoclastic enzymes are shown to be present in flour. The effect of diastase, pepsin, trypsin, pancreatin, steapsin and rennin on the bread when present in the flour is noted. Enzymes occurring in flour may be in such proportions that they do a great deal of harm; however, it may be possible to use them to improve the baking quality.

H. A. LEPPER

Experiment on suggested method for determination of gluten by dissolving in acetic acid. S. J. LAWELLIN. *J. Am. Assoc. Cereal Chem.* 5, No. 1, 9-16(1920).—The method of Marchadier and Goujon after modification for the detn. of gluten (gliadin and glutenin) based on the soly. of gluten in glacial AcOH was studied. The method is inaccurate as it will not ext. total protein or gluten from flour nor ext. them pure. It is of no value in routine work, being also disagreeable, lengthy, and tedious. The results obtained indicate that a quant. sepn. of proteins of flour from each other can be made by extg. with glacial AcOH and the accuracy has been fairly well established but no attempt has been made to isolate or identify the sepd. proteins. H. A. L.

A volumetric method for the determination of sugars in flour. J. R. HESS. *J. Am. Assoc. Cereal Chem.* 5, No. 1, 7-8(1920).—A method is described combining the gravimetric procedure with Fehling soln. and the Kendall method for the detn. of Cu. H. A. LEPPER

Rapid volumetric determination of reducing sugars in cereal products. SAMUEL J. LAWELLIN. *J. Am. Assoc. Cereal Chem.* 6, No. 1, 3-7(1921).—The method of Scales (*C. A.* 13, 1990) was found to be an accurate, rapid method for reducing sugars in cereal products on comparison with the official Munson and Walker general method of the Assoc. Off. Agr. Chem. on 37 samples (flour, bread and starch). It is the most efficient, shortest and least tedious method yet proposed for this detn. H. A. L.

Some nitrogen determinations. DEAN YOHE. *J. Am. Assoc. Cereal Chem.* 5, No. 1, 19(1920).—A table of 30 detns. by the Kjeldahl method for N in flour shows that it is not necessary to have an excess of standard acid to catch the distillate; no NH<sub>3</sub> is lost if the distillate becomes alk. H. A. LEPPER

Control of rope in bread. C. B. MORISON AND F. A. COLLATZ. Am. Inst. Baking, *Bull.* 5, 18 pp.(1921).—The characteristics are given of the cultures obtained from a rope-infected flour, used in the baking expts. The influence is reported of addition of AcOH, lactic acid, HCl, H<sub>2</sub>SO<sub>4</sub>, NaHSO<sub>4</sub>, alone and with KH<sub>2</sub>PO<sub>4</sub> on the quality,

$p_H$ , and development of rope in bread made from 3 grades of flour. The difficulty of producing bread of good quality and of  $p_H$  necessary to inhibit rope by addition of acid and acid salts to several grades of flour is shown. Inoculated doughs from patent and blend flours respond more readily to treatment than the clear. Various combinations of  $\text{NaHSO}_4$  and  $\text{KH}_2\text{PO}_4$  inhibit rope in the former flours;  $\text{NaHSO}_4$  alone does not produce bread of good quality. The inhibition of development of rope-producing organisms in bread at  $p_H$  higher than 5.0 is indicated in these expts. A note on the use of methyl red to det. acidity in bread and a bibliography of 30 references are given.

H. A. LEPPER

Alkalinity and phosphate determination in the ash of foods. J. TILLMANS AND ANNA BOHRMANN. Frankfurt a. M. *Z. Nahr. Genussm.* 41, 1-17 (1921).—A modified method for the detn. of alkalinity is proposed. The finely ground ash is treated with 50, or if necessary 100 cc. of 0.1 *N* HCl. After it has stood 15 min. in the cold, a spoonful of pure, powdered NaCl is added and the mixt. shaken vigorously. Agitation of the liquid with a small rubber bellows aids in removing  $\text{CO}_2$ . Thirty cc. of 40%  $\text{CaCl}_2$  soln. and 0.2 cc. of 1% phenolphthalein are now added and at 14° the surplus acid is titrated with 0.1 *N* NaOH. It is advisable to allow the liquid to stand in a closed flask for 2 hours before completing the titration. The difference between acid and alkali gives the alkalinity due to oxides and carbonates. Reference to the original must be made for details of the ortho-, pyro- and metaphosphate detns. The methods described were more successfully applied to artificial mixts. than former methods. *Milk ash* contained a slight alkalinity and 30-40% phosphates (ortho-); *flour ash* contained no characteristic alkalinity and a mixt. of phosphates; *ash of beef and horse flesh* contained no carbonates or oxides but a mixt. of 6-7% ortho- and 47-50% pyrophosphates; the alkalinity of the *fruit juice ash* examd. was due chiefly to carbonates and all the phosphate ion present (15-20%) was in the ortho- condition. The alkalinity of *cocoa ash* was due to a mixt. of oxides and carbonates. 33% of orthophosphate was present.

D. B. DILL

The influence of feeding on the quantity and composition of milk, especially on its fat content. F. HONCAMP. Rostock. *Z. Nahr. Genussm.* 41, 17-26 (1921).—A critical discussion. H. suggests as an explanation of the fact that palm-kernel cake and coconut cake exert a favorable influence on the production of milk fat that their oils may contain an unusually large proportion of the glycerides which can be directly employed by the milk glands. From theoretical as well as practical observations it is held that the fat content of milk declined during the war period of insufficient feeding.

D. B. DILL

The mercuric chloride and calcium chloride serums of milk. LEON PANCHAUD. *Mitt. Lebensm. Hyg.* 12, 28-35 (1921).—The method of Ambühl and Weiss for detg. added  $\text{H}_2\text{O}$  in milk by the  $n$  of the  $\text{HgCl}_2$  serum (*C. A.* 13, 2095) was found to have a sensibility equal to the  $\text{CaCl}_2$  method of Ackermann. The  $\text{HgCl}_2$  reagent must be very accurately measured. The difference between the refractive indices of  $\text{CaCl}_2$  and  $\text{HgCl}_2$  serums on the same fresh milk is const. and equal to 3.3 divisions of Zeiss immersion refractometer. This difference is not const. on milk from sick cows usually high in solids-not-fat. Formulas are derived for calcg. added  $\text{H}_2\text{O}$  wherein correction is made for the increase in  $n$  due to the dissolved  $\text{HgCl}_2$  or  $\text{CaCl}_2$ , comparative results being given with calcn. by the simple formulas in general use. In acid milk (spoiled) the  $\text{HgCl}_2$  serum filters remarkably clear while the  $\text{CaCl}_2$  does not and  $n$  diminishes in proportion to that of the original fresh milk, the lactic acid having a smaller  $n$  than the lactose from which it is formed. This is true of the  $\text{CaCl}_2$  serum of acid milk also. On milk high in solids-not-fat obtained during some periods of lactation, the 0.3 cc. of  $\text{HgCl}_2$  reagent is sometimes not sufficient properly to clarify the milk, but 0.4 cc. has been found to give a clear serum in all cases. On similar milk from sick cows  $\text{HgCl}_2$  does

not ppt. all the proteins and does not give a clear serum. As the last 2 named types are infrequently met with, the A. and W. method is recommended for control laboratories where a chemist is in charge. It is not as quick as Ackermann's method and will not replace the latter in general.

H. A. LEPPER

**Determination of chlorine in milk without ashing.** J. WERDER. *Mitt. Lebensm. Hyg.* 12, 37-8(1921).—Boil under reflux in a 300-cc. flask 50 cc. of milk with 25 cc.  $\text{HNO}_3$  (sp. gr. 1.15) for 30-40 min. Cool, add 20 cc. 0.1 N  $\text{AgNO}_3$  and heat 15 min. on the  $\text{H}_2\text{O}$  bath. Filter and if the fat, undestroyed by acid, is not sepd. ext. it with 20 cc.  $\text{Et}_2\text{O}$ . Add 2 cc. satd.  $\text{FeNH}_4(\text{SO}_4)_3$  soln. and titrate excess Ag with 0.1 N  $\text{NH}_4\text{SCN}$ . Results compare favorably with the ash method.

H. A. LEPPER

**Iron as a reason for a formalin and diphenylamine reaction in milk.** F. REISS. Kalkherge. *Z. Nahr. Genussm.* 41, 28-9(1921).—Milk standing in contact with rusty nails for 5 hrs. dissolved enough Fe to acquire an astringent taste and to give a reaction with formalin and diphenylamine similar to that produced by nitrates. It is suggested that shipping milk in rusty cans may have similar results.

D. B. DILL

**The effect of the Becquerel and Röntgen rays as well as ultra-violet light on peroxidase and the methylene blue-formalin-reductase reaction of cow milk.** H. REINLE. *Biochem. Z.* 115, 1-21(1921).—Preliminary expts. having demonstrated that toluene is a satisfactory preservative of fresh cow milk, R. detd. the effect of a 48-hr. application of Becquerel rays on the aldehyde-reductase and peroxidase of several 300-cc. samples. The radiation was obtained from 807 mg.  $\text{RaCl}_2$  so shielded with a Pb mantle as to permit the passage of gamma rays in max. amt. In none of the expts. with Ra could any evidence be obtained of any action of the rays on the enzymes studied, nor was there any reactivation of enzymes in milk heated to  $100^\circ$ . When Röntgen rays were applied to fresh milk and to the heated milk there was neither a stimulation or depression of enzyme activity in the former nor reactivation in the latter. No heating effect of the rays was observed. When ultra-violet radiation was employed there occurred at first an apparent increase in enzyme activity with a later slowing down of the reaction. This preliminary increase was found to be due to the heat effect of the radiation, which had raised the temp. from  $10^\circ$  to  $25^\circ$ . The reduced enzyme activity which took place at a later period is genuine and due to the action of the ultra-violet light.

F. S. HAMMETT

**Temperature control as related to improvement in milk, cream and butter supplies, and how it should be applied.** J. M. W. KITCHEN. *Med. Rec.* 99, 565-9(1921).—K. points out that proper temp. control of all the processes concerned in getting milk, cream and butter supplies to the public is a vital essential in production from the bacteriological point of view. He advocates the maintaining of milk in insulated containers at temps. sufficiently high to inhibit bacterial activity.

F. S. HAMMETT

**The development of the dairy industry.** W. WEIDEMANN. Darmstadt. *Chem. Ztg.* 45, 253-4(1921).—A discussion of the industry from 1915 to 1920.

H. A. LEPPER

**Degerminating corn.** STEPHAN WEISER. *Landw. Vers.-Sta.* 97, 93-110(1920).—The oil content of corn embryos varied from 24.0 to 28.7% based on dry wt. Degermination was most successful when the moisture content of the corn was 15-15.5%. Expts. were conducted with swine to show the influence of degerminating upon the nutritive value of corn. Degermination appeared to cause no noteworthy depreciation of the feeding value. Data show that the free fatty acids in the oil from corn embryos was about 100% greater in embryos which had not been warmed than in embryos which had been dried. During the summer months the free fatty acid content increased. Warming the embryos to  $70-80^\circ$  greatly reduced the amt. of free fatty acids developed. The heating process, however, did not seem to prevent worms from developing in the stored embryos.

F. M. SCHERTZ

**The wastes of coffee.** E. VAUTIER. *Mitt. Lebensm. Hyg.* 12, 35-7(1921).—Com-

parison of sound coffee and black berries (green and roasted) with respect to ash,  $\text{Et}_2\text{O}$  ext., caffeine, and  $\text{H}_2\text{O}$ -sol. ext. content show it to be impossible chemically to detect the presence of waste berries in coffee or even to depend alone on the ordinary chem. analysis for detg. the content of shells, hulls or other debris. Organoleptic examn. permits of a more effective control. Also in *Schweiz. Apoth. Ztg.* 59, 181-3 (1921).

H. A. LEPPER

The hygienic importance of color-containing meats. M. REUTER. *Vierteljahrs. ger. Med.* 61, 110-124 (1921).—A rambling dissertation on the importance of color in animal material, of no particular novelty.

F. S. HAMMETT

Hypochlorite process of oyster purification. ANON. *U. S. Public Health Repts.* 36, No. 16, 876-83 (1921).—The *B. coli* content of oysters scoring 50 or more when placed for 18-24 hours in water sterilized with hypochlorite is reduced about 90%. Such treatment of oysters, regardless of origin, would insure an additional safety factor to public health.

G. C. BAKER

Preparation of sugar-free cream for diabetics. FLORENCE H. SMITH AND W. D. SANSUM. *J. Am. Med. Assoc.* 76, 792-3 (1921).—One gal. of cream was poured into a 10-gal. milk can, water, at proper temp. for skimming, was added to fill the can, and the mixt. thoroughly stirred. The separator was adjusted to deliver through the cream outlet 0.1 of the contents of the can. The cream was sepd. and the reservoir and bowl rinsed, while still running, with warm water. By repeating this process of diln. and sepn., cream was obtained which contained less than 0.01% carbohydrate, 0.23 protein, 32.0 fat and 0.05 ash. The loss of sugar and salts alters the flavor of the cream. This may be practically restored by the addition of 0.5 to 0.7% NaCl and saccharin to taste. The latter should be added just before serving or a bitter taste develops. The product keeps well, is simple to prepare, safe, economical, and used as cream or dild. with water forms a welcome addition to the diabetic diet.

L. W. RIGGS

Straw hydrolysis. STEPHAN WEISER AND ARTHUR ZAITSCHEK. *Landw. Vers.-Sta.* 97, 87-92 (1920).—A report of feeding expts. (horses and sheep) with straw hydrolyzed by several different methods.

F. M. SCHERTZ

The chemical composition and the yield of green corn cut at different periods (WEISER, ZAITSCHEK) IID. Purification of cossette press waters and their utilization in the manufacture of yeast feeds (REINKE) 28.

LEFRINCE, MAURICE and LECOQ, RAOUL: Guide pratique d'analyses alimentaires et d'expertises chimiques usuelles. Paris: Vigot frères. 750 pp. 40 fr. For review see *Bull. hyg.* 8, 638 (1921).

Artificial milk. L. BERCZELLER and R. GRAHAM. *Brit.* 157,351, Jan. 10, 1921. Soy beans for use in making artificial milk are, before reducing or grinding, extd. first with an acid and then with an alk. soln., the alkali being used in such quantity as to neutralize the remaining acid and leave the material slightly alk. The beans are then ground in  $\text{H}_2\text{O}$  containing alkalies, and if desired, phosphates, and the liquid is strained. The strained liquid is sterilized and sugar and emulsified vegetable fats are added. Oxidizing substances, such as  $\text{H}_2\text{O}_2$  and  $\text{KMnO}_4$ , may be added during the extn. with acids. The acid required may be produced by bacterial fermentation while the beans are soaking.

Artificial milk. L. BERCZELLER and R. GRAHAM. *Brit.* 157,352, Jan. 10, 1921. Addition to 157,351 (above). In a process for making artificial milk from soy beans comprizing successive extn. with acid and alkali, the beans are treated with nitrites or  $\text{HCHO}$  to destroy ill-flavored amines. Ferrous salts may be added to the nitrites

as catalyzers. These materials are preferably, but not necessarily, added during the extn. with alkali. The milk is also boiled *in vacuo* to sterilize it and remove volatile amines, the temp. being kept low enough to avoid decompn. of anti-rachitic vitamins.

**Modified milk powder.** A. R. COULSON. U. S. 1,374,138, Apr. 5. A modified cultured milk mixt. comprizing sweetened curdled skim milk 50-80%, and salted butter-milk 20-50% is converted to a dry powdered form for use in bakery products and other cooked foods.

**Evaporating and pasteurizing liquids.** J. F. RUFF. Brit. 157,514, Oct. 6, 1919. In evaporating or heating liquid by means of submerged rotating internally heated drums provided with scrapers, the liquid is agitated and cooled by forcing air into and through it by pipes. The drums consist of a shell with heads having passages leading to hollow shafts. The surface of the drum is kept at 143-149° by steam, hot liquid or elec. heaters. Milk may be pasteurized at 76°. The app. may be used for concentrating milk, cider, and fruit juices.

**Sterilizing cheese.** E. E. ELDREDGE. U. S. 1,374,141, Apr. 5. Cheese is mixed with about 2% of Na phosphate and heated to a sterilizing temp. The phosphate serves to prevent disintegration of the cheese.

**Treating whey; fertilizers.** J. TAVROGES, J. W. ROCHE and G. MARTIN. Brit. 158,816, July 22, 1920. Bleaching powder is used to ppt. albumin from whey, which has been heated and agitated by steam. The ppt. mixed with CaO sets as a hard mass and can be used as a fertilizer.

**Butter substitute from hydrogenated oils.** C. ELLIS. U. S. 1,372,614, Mar. 22. Hydrogenated coconut oil is mixed with a smaller amt. of hydrogenated peanut oil (or the oils are hydrogenated together in similar proportions) to prep. a butter substitute.

**Edible oil mixture.** C. ELLIS. U. S. 1,372,615, Mar. 22. A normally liquid oil such as peanut oil is hydrogenated to a consistency of tallow or harder and is mixed with a greater amt. of unhydrogenated coconut oil or similar oil to obtain a lard-like or butter-like product suitable for use as a food.

**Ethyl stearate as a food.** C. ELLIS. U. S. 1,372,616, Mar. 22. A shortening is prepd. by mixing ethyl stearate with other fatty material such as beef fat and cotton-seed oil.

**Flour improvers.** H. GREVILLE. Brit. 158,917, June 27, 1919. A bleaching and oxidizing agent to be added to flour contains permeta- and perpyrophosphates or  $H_2PO_4$  in the dry form as distinguished from the soln. described in 124,298, (C. A. 13, 1608). The salts are prepd. by the evapn. *in vacuo* of a mixt. of  $H_2O_2$  with meta- or pyrophosphate of a suitable base such as Na or Ca or by the electrolysis of cooled solns. of the same salts. Other salts such as  $Ca(HPO_4)_2$  may be added, and the agent may form part of a baking powder mixt. to be added to the flour.

## 10—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The industrial preparation and filtration of colloidal solutions and masses. J. H. FRYLENDER. *Rev. prod. chim.* 24, 173-82(1921).—The main principles of colloidal chemistry are very briefly reviewed. Plauson and Block's "colloidogenetic" mill is described, together with its application to the industries of petroleum, shale oil, press cake, fuller's earth, decolorizing charcoal, resins, fuel (liquid coal), graphitic lubricants, plastics, artificial silk, cellulose esters, saccharification of cellulose, pigments, phosphate fertilizers, hydrogenation of oils, soap, lignite refining, extn. of lignite wax, artificial milk, extn. of glue from waste materials, starch, Hg, I, colloidal S, foods, ultramarine, and rubber reclaiming. Plauson's method of ultrafiltration (See Schmitt, C. A. 14,

3763) is described, and mention is made of its applications in the industries of ceramics, mineral pigments, water purification and sterilization, coloring matters, varnish, sugar, mineral oils and tar, animal and vegetable oils, and dust prevention.

A. P. -C.

**Economic competition between the West and the East.** J. W. BRCKMAN. *J. Elec. Western Ind.* 46, 445-7 (1921).—The pioneer spirit that was responsible for the settlement of the West must be carried also into its industrial development, which cannot be modeled along Eastern lines. B. discusses the possibility of establishing the following industries in the Pacific states: Cu refining, iron and steel, utilization of timber waste, cyanamide (raw material for HCN for the orange groves), etc. A closer coöperation between our banking institutions and chem. industries is urged. C. G. F.

**The patent protection situation in the Czecho-Slovak Republic.** E. HÜTTNER. *Oesterr. Chem. Ztg.* 24, 42-3 (1921). E. H.

**Notes on patent law and practice.** C. A. HACK. *Chem. Eng. Mining Rev.* 13, 170-6 (1921). E. H.

**The transportation and measurement of liquids about the plant.** H. RABE. *Chem. Ztg.* 45, 165-69, 191-3 (1921).—A rather thorough treatment of the problems encountered in conveying liquids such as acids, alkalies, salt solns., and oils, from one place to another about the plant, with especial emphasis upon low cost of operation and maintenance. The principal types of pumps, plunger, rotary, and centrifugal, are discussed and the advantages of one type over the others are noted in the case of special requirements. The various types of pneumatic liquid elevators and acid eggs are noted, and the whole is illustrated by means of 10 figures and half tones. A review is given of the patent literature covering devices employed in the plant or factory for conveying and measuring liquid chemicals. J. T. R. ANDREWS

**The control of lubricating oils.** R. DUBRISAY. *Ann. fals.* 13, 25-33 (1920).—The complexities in the physics of lubrication are pointed out. It is essential that the oil be non-corrosive, not easily saponified by heat, possess a high point of inflammability, and be non-resinifying. The most serviceable means of differentiating between oils for certain mechanical friction is by viscosity. The several types of viscosimeters are discussed and D. described his design of viscosimeter for oils. It is essentially two bulbs of 2 cc. capacity each and connected by a tube so that the whole forms a pipet. It is useful in the smaller oil stations, whereas the other viscosimeters are meant to be used by skilled operators with lab. control. H. F. ZOLLER

HARRIES, C. D.: *Wissenschaftliche Veröffentlichungen aus dem Siemens-Konzern*. Vol. I. Berlin: Jul. Springer. 201 pp. For review see *Chem.-Ztg.* 45, 371 (1921).

**Luégers Lexikon der gesamten Technik und ihrer Hilfswissenschaften.** 2nd Ed. revized. II. Supplement. Stuttgart: Deutsche Verlags-Anstalt. M140. For review see *Wochbl. Papierfabr.* 51, 3397 (1920).

**Werkstoffe.** Handwörterbuch der technischen Waren und ihrer Bestandteile. Edited by Paul Kraus. Vol. I A-F. Leipzig: J. A. Barth. M90, bound M115. For review see *Kunststoffe* 11, 60 (1921).

**Effecting chemical reactions.** T. GOLDSCHMIDT SALKENBERGSEWG and H. ARNOLD. *AKT.-GGS. Brit.* 158,836, Jan. 31, 1921. Chem. reactions in which, before their completion, a state of equil. is attained, are rendered practically complete by passing the reaction materials through a series of vessels at a suitable temp., between each of which the reaction product or a part thereof is removed by cooling, whereby the equil. is destroyed and the reaction allowed to proceed afresh in the next vessel. E. g., Cl and olefin-containing gas may be alternately passed through a heated chamber and cooled to -20° to sep. out the olefin chlorides.

**Separating gaseous mixtures by liquefaction.** SOC. E. BARBET ET FILS ET CIE. Brit. 159,131, Feb. 11, 1921. In the continuous rectification of liquid air, the cold necessary to compensate for loss by radiation, etc., is obtained by operating the N compressor at a higher pressure, the cold being produced by the expansion of the unliquefied portion of the N. The process is stated to be applicable to the rectification of other gases. A suitable app. is specified.

**Separating gases from liquids.** C. HULSMAYER. Brit. 157,789, Jan. 10, 1921. Liquids containing small quantities of gases, e. g. feed water containing air, are purified by passage over finely divided materials presenting a large surface of contact, such as steel wool, fine turnings or shavings of wood and bone, metal chips, and loose fibrous materials such as horsehair. A suitable construction is specified.

**Purifying gases.** H. HERNU. Brit. 157,237, Jan. 10, 1921. A tube supplies H<sub>2</sub>O to the center of a turbine having staggered blades, which spread the H<sub>2</sub>O in a circular sheet for scrubbing the gas as it issues through the pipe. Suspended matter is caught and projected to the periphery of rapidly rotating disks having gas ways in the form of sectors or circles; one disk has an enveloping rim to oppose passage of the gas except through the gas ways, which, in a modification, may have upturned lips forming baffles or may take the form of a helix. Some of the disks may be stationary. A second turbine, the rear face of which has exhaust blades and outlet passages, draws and ejects the gas. The app. may be used for purifying H<sub>2</sub>O or as a refrigerator or purifier for vehicles using gas.

**Filtering gases and vapors.** C. GROSSH. Brit. 157,966, Jan. 10, 1921. A portion of the gas or vapor which has passed through a filter is cooled to remove moisture and reheated, and is either returned directly to be mixed with the supply of gas to be filtered or passed first through the filter in counter-current to clean it. A suitable app. is specified.

**Recovering volatile solvents.** J. W. MELTON and C. DOWNS. Brit. 159,039, Nov. 29, 1919. Air which has been used for evapg. solvents in a process of extg. oil, etc., from seed, nut, or like meal and has been freed from the bulk of the vaporized solvent in condensers is passed through chambers containing fresh meal to be treated, by which the remainder of the solvent is absorbed. A suitable app. is specified.

**Non-inflammable volatile liquids.** A. HENNING. Brit. 158,494, July 15, 1920. EtCl, which may contain MeCl, is rendered non-inflammable by mixt. with MeBr. The products are prepd. for use as solvents for the extn. of oils or for dry-cleaning processes, as vehicles for perfumes, etc., as fire-extinguishers, and as refrigerating agents.

**Lubricants.** J. J. HOOD, H. SPENCE and SPENCE and SONS, LTD. Brit. 158,922, Aug. 16, 1919. Finely divided Al, such as is made by pounding the metal in stearic acid, is used as a constituent of lubricants. It may, e. g., be mixed with H<sub>2</sub>O, animal, vegetable or mineral oils, greases, emulsions, or saponaceous solns. There may be added mica, graphite, or other suitable solid either with or without a deflocculating agent. In examples, 5 parts of Al are mixed with 95 parts of petroleum jelly or 47.5 parts of petroleum jelly and 47.5 parts of lubricating oil, or with 95 parts of solidified oil.

**Lubricants from tar oils, etc.** O. T. ORTO. Brit. 158,252, Jan. 17, 1921. Tar oils and the like are treated to render them suitable for lubricants first with an alkali such as caustic potash, and water glass, to remove creosote, phenols, and resins, and then with Al acetate.

**Testing lubricants.** OELWERKE STERN-SONNEHORN AKT.-GES. Brit. 157,322, Jan. 10, 1921. In an app. for testing lubricants a test bearing, mounted on a shaft resting on ball, roller, or other bearings, is adjustably loaded, rotated, and heated or cooled, and the temp. of the bearing and lubricant, and the consumption of lubricant and power are measured.

**Insulating compositions.** SIEMENS-SCHUCKERTWERKE. Brit. 157,119, Jan. 8,

1921. Addition to 156,527 (C. A. 15, 1772). Cellulose ethers, alone or mixed with bitumen, are used for insulating purposes either dissolved in the form of a lacquer or as a plastic mass, to which natural or synthetic oily or fatty substances and fillers may be added. The plastic material may be either applied directly in a heated condition to the surface which is to be insulated or it may be wound on to conductors in the form of a band, the edges of which are subsequently fused together. It is preferably tempered by heating to 35–50° either before or after molding. The ethers may contain one radical only or two or more radicals of the same kind or of different kinds, e. g. benzylcellulose, and the mono- di- and trialkyl cellulose ethers. Mixts. of different ethers also may be used.

**Insulating compositions.** SIEMENS-SCHUCKERTWERKE. Brit. 157,120, Jan. 8, 1921. Addition to 156,527 (C. A. 15, 1772). Cellulose derivs., particularly esters, such as nitrocellulose, acetylcellulose, and viscose, and ethers, such as methyl, ethyl, propyl, butyl, and benzyl cellulose ethers, are mixed with non-hygroscopic, liquid or plastic insulating substances such as waxes, oils, fats, resins, gutta-percha, etc., with or without bitumen and filling ingredients. Castor oil, treated with H or not, is a suitable insulating ingredient.

**Electric insulating material.** F. JUCHLI. Brit. 157,415, Jan. 10, 1921. An elec. insulating material consists of paper pulp and a phenol-aldehyde condensation product. The ingredients are mixed in a paper-making machine, dried, and hot-pressed into plates or sheets at a high pressure, such as 50 kg. per sq. cm.

**Electrical resistance material.** J. G. CLEMENS. U. S. 1,372,642, Mar. 22. An elec. resistance material adapted for use in motor starting resistances is formed by molding finely divided reduced Fe or other resistance metal with a binder such as  $H_2O$  and then heating to dull redness after driving off the moisture.

**Coating for boilers and pipes.** R. D. ASLATT. U. S. 1,372,664, Mar. 29. A compn. for mixture with liquid to be applied as a coating in plastic form on boilers or pipes is formed of comminuted clay 1, chalk 2 and comminuted pulped and loose fiber 9 parts each.

**Melting basalt, etc.** SOC. LE BASALTE. Brit. 158,227, Nov. 24, 1920. Basalt and like mineral substances are melted in a reverberatory furnace to which the material is fed through a pre-heating shaft serving also as the chimney. The molten material collects in a transverse well in the hearth, and passes thence to side settling-chambers. The furnace is heated by gas and air supplied through ports, the air being heated in passages beneath the hearth.

## 14—WATER, SEWAGE AND SANITATION

EDWARD EARTOW

**Hydrogen-ion concentration and water purification.** R. EDMAN GREENFIELD. *Fire and Water Eng.* 59, 736–7(1921).—A discussion of H-ion concn. from the point of view of the water chemist and a method for detg. it are given. Also in *J. Am. Water Works Assoc.* 8, 397–401 (1921). G. C. BAKER

**Residual aluminium compounds in water filter effluents.** ABEL WOLMAN and FRANK HANNAN. *Chem. Met. Eng.* 24, 729–35(1921); *Can. Engr.* 40, 275(1921).—Theoretical considerations, supported by exptl. results obtained in water work and elsewhere, seem to show that the reaction of  $Al_2(SO_4)_3$  with the natural alkalinity of a water is a complex mobile transformation. The reaction seems to be delicately dependent upon the H concn. rather than upon its potential alkalinity. The H-ion concn. is regulated to a large degree by  $CO_2$  equil. Evidence seems to indicate that complete pptn. of  $Al(OH)_3$  takes place at a H-ion concn. near neutrality,  $pH$  7.0, unless disturb-



ing or buffer influences are operative. Outside of this zone re-solution of the insol. flock occurs.

G. C. BAKER

**Improvements in Trenton water purification.** ANON. *Pub. Works* 50, 341-3(1921).—Trenton derives about 20 mil. gal. daily of water from the polluted Delaware R. Rapid filters pump the water, using about 1.6% waste water. The coagulant varies from 50 to 450 lbs.  $Al_2(SO_4)_3$  per mil. gal., two lbs. liquid Cl are used per mil. gal.  $H_2O$ . Alum is manuf. by the Hoover process at a cost of \$28.00 per ton. Cl is made electrically from brine at a cost of 9 cents per lb.

LANGDON PEARSE

**Water chlorination control by the absorption method.** ABEL WOLMAN. *Eng. News-Record* 86, 639-40(1921).—Two years' control of chlorination by the absorption method has proved that the method is a success. Expts. on Luke, Md., water show that it is safe to dose this supply at a rate of 0.2 p. p. m. in excess of the amt. of Cl absorbed by it in 5 min. The 0.2 p. p. m. excess is the factor of safety and varies with the character of the water.

FRANK BACHMANN

**Fluorescein an aid to tracing water underground.** HERMAN STABLER. *Eng. News-Record* 86, 639(1921); *Eng. Contr.* 55, 377(1921).—Fluorescein, 1 part in 40,000,000 is visible to the naked eye. In practice, it has been found that a dose of this dye should be computed to give about 1 part in 10,000,000 parts of water. The dye has been successfully used in tracing underground connections, leakages in canals, etc.

FRANK BACHMANN

**Stream pollution in Wisconsin.** W. G. KIRCHOFFER. Committee Report Wis. Eng. Soc. *Eng. Contr.* 55, 367(1921).—The statistics of 26 watersheds in Wisconsin are given.

LANGDON PEARSE

**Comprehensive report on water supply of Kansas City, Mo.** FULLER AND MCCLINTOCK. *Eng. News-Record* 86, 499(1921).—The project outlined is for 108,000,000 gal. daily at a cost of \$18,000,000. The population to be served in 1943 is estd. at 700,000. The water purification plant will consist of grit chambers with hopper bottoms; reaction chambers baffled to produce a velocity of 1 ft. per min.; 4 preliminary settling tanks equiv. to 9-hr. flow; 4 coagulating basins with 12-hr. flow; 18 filters each with 4,000,000 gal. daily capacity, and other appurtenances.

FRANK BACHMANN

**Tuning up the East Chicago filters.** H. E. JORDAN. *Eng. News-Record* 86, 520(1921).—The normal capacity of the plant is 8,000,000 gal. per day operating at a rate of 125,000,000 gal. per acre per day. The plant supplies 36,000 people. Water consumption before filtration was estd. at 300 to 360 gal. *per capita*. It is the intention to install meters to reduce the consumption. The turbidity of the water is less than 25 p. p. m. Diatoms range in the daily counts from 1000 to 2000 standard units per cc. The diatoms have been reduced by increasing the alum dosage to 200 lb. per mil. gal. Tastes in the supply due to discharge of industrial wastes into Lake Michigan have caused serious complaints.

FRANK BACHMANN

**Water-borne typhoid fever at Greenville, Tenn.** C. N. HARRUB. *J. Am. Water-Works Assoc.* 8, 132-37(1921).—The supply is from a spring out of limestone and is collected in a partly covered concrete pool, poorly protected and sepd. from a "filthy creek" simply by a concrete wall. At the time of the epidemic the hypochlorite plant was out of order, insufficient Cl was being used and the water was badly contaminated. Liquid Cl was substituted for "hypo" and conditions improved.

D. K. FRENCH

**Self-cleansing underground water collecting system.** GEO. I. PRINCE. *J. Am. Water-Works Assoc.* 8, 147-50(1921).—The supply is collected in a wooden gallery under a river bed, and materials in the water are of such a nature as to cement over and seriously retard the infiltration of the water. A method is described whereby the flow is reversed under pressure and the coating removed.

D. K. FRENCH

**Tropical water supplies.** DON M. GRISWOLD. *J. Am. Water-Works Assoc.* 8,

157-160(1921).—All supplies are considered unsafe save that of Port-of-Spain on Trinidad, and island of Dominica.

D. K. FRENCH

**Sanitary rating of the Indiana Public Water Supplies.** JOHN C. DIGGS. *Eng. News-Record* 68, 686(1921); *Eng. Contr.* 55, 374-5(1921).—Ratings were based on various factors including source of supply, chem. and bacteriol. analysis, equipment for treatment plant, and character of the personnel responsible for the water plant.

FRANK BACHMANN

**Dosing tanks for sprinkling filters.** PETER GILLESPIE. *Can. Eng.* 40, 403-4(1921).—The method of design is described, with data.

LANGDON PEARSE

**Present status of activated-sludge process.** EDWARD BARTOW. *Am. Soc. Mun. Impvt.* 1920; *Pub. Works* 50, 356-8(1921).—Various installations at Houston, Manchester and Worcester (England) are described, as well as the Dorr-Peck process. The need is for less air and better facilities for sludge drying.

LANGDON PEARSE

**Sewage-treatment testing station at Grand Rapids, Mich.** MILTON P. ADAMS. *Eng. News-Record* 86, 459-61(1921); cf. *C. A.* 15, 1179.—The sewage testing-station originally consisted of a 32' tank of the Dortmund type, 30' deep with a hopper bottom having 45° slopes; 3 sludge-digestion tanks, each 20' by 28' deep with conical bottoms; 4 tanks each 4' by 26' deep; and 40' by 80' sludge bed. On account of the presence of paper-mill and gas-house wastes, the sludge could be dried in fresh condition without digestion. The present testing station consists of a Dorr sewage clarifier built out of the Dortmund tank, with a 14' central and 12' peripheral depth. The sewage enters the Dorr clarifier 5.5 ft. below the water surface at the center of the tank, the settled sewage passing off at the periphery. Analyses indicate that from 27 to 59% of the total suspended solids is removed at a rate of 960 gal. sewage per sq. ft. of tank area per 24 hrs. A sludge well is provided in the center of the tank extending from the top of the tank to within 9" of the floor and is 11' in diam. at bottom and 4' at the top. A small bucket elevator removes the sludge from the top of the sludge well. The sludge had a moisture content of 80%. After it is dried on sludge beds, the sludge can be burned. Its heat value is 7,000 B. t. u.

FRANK BACHMANN

**Operating data on Reusch-Wurfscreen and Imhoff tanks.** J. D. DOWNES. N. J. Sewerage Assoc. *Eng. Contr.* 55, 368(1921); *Pub. Works* 50, 370(1921).—The plant was designed to serve 40,000 people, on a sep. sewerage system. Ahead of the original 6 Imhoff units, two years later, a R.-W. screen 10 ft. in diam. was added, with  $\frac{1}{16}$  by 2 in. slots. Operating data are given with analyses. About 4,000 cu. yd. of sludge are removed yearly for a population of 35,000. From 5.8 to 6 dryings per year are averaged, or 0.686 sq. ft. per person, with sludge applied 9 in. deep. Considerable floating sludge is removed.

LANGDON PEARSE

**Design of sewage-digesting tank.** E. P. DEWEY. *Eng. Contr.* 55, 360(1921).—A different scheme of baffling tanks is suggested.

LANGDON PEARSE

**Liability of municipality for nuisance in garbage disposal.** JOHN SIMPSON. *Pub. Works* 50, 354-6(1921).—Decisions of various state courts hold the municipality liable for nuisance whether or not acting in governmental capacity. Decisions differ on the liability of the city for the nuisance created by contracts for garbage disposal.

LANGDON PEARSE

**Some of the engineering aspects of public health.** JAMES A. TOBEY. *Eng. News-Record* 86, 668-70(1921).—The engineering aspects include the development of pure water supplies, the proper and safe disposal of excreta and wastes, ventilation, illumination, safety engineering and other phases of industrial sanitation, housing and city planning, malaria control, and finally, public health administration itself. Many leading health officers are trained as engineers.

FRANK BACHMANN

**Recovery of oils and fats from industrial waters (BARTH) 27. The eosin-methylene blue agar (LEVINS) 11C. Extracting fat from garbage (U. S. pat. 1,372,479) 27.**

GRÜNHUT, L.: *Trinkwasser und Tafelwasser*. Leipzig: Akad. Verlagsges. m. b. H. 334 pp. M. 36 + T.-Z.

Water filter. O. CONGLETON. U. S. 1,372,119, Mar. 22. The app. is adapted for filtering  $H_2O$  in large volumes.

Apparatus for purifying boiler-feed water. J. C. BEATTIE. U. S. 1,372,393, Mar. 22. The water is purified by heating and settling.

Purifying water. E. J. MAGRAZE. Brit. 158,498, Sept. 13, 1920. App. of the type described in 18,867, 1914 (C. A. 10, 503), for treating  $H_2O$  with zeolite or other reagent requiring occasional regeneration, comprises a vessel having a compartment containing the reagent on a bed of gravel or the like and a compartment for the regeneration soln., fitted with ball and a removable filter, etc.

Sterilizing liquids. W. PATTERSON. Brit. 158,578, Aug. 1, 1917. In sterilizing  $H_2O$  or other liquid by addition of  $Cl$  or other gas,  $H_2O$  and  $Cl$  are passed in regulated streams to an absorber and the chlorinated  $H_2O$  which collects in a vessel is supplied to the main flow of  $H_2O$  in proportionate quantities. A suitable app. is specified.

Settling apparatus for thickening sewage sludge and similar materials. C. ALLEN. U. S. 1,372,134, Apr. 5.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER AND ALBERT R. MERTZ

Some studies on the rate of formation of soluble substances in several organic soils. M. M. MCCOOL AND L. C. WHEATING. *Soil Sci.* 11, 233-47(1921).—By means of the f. p. method the rate of formation of sol. material was detd. in 7 org. soils under different moisture and temp. conditions and at different depths. At any given moisture content higher temps. tend to bring more material into soln. and lower temps. decrease the rate of formation. In general the ability to yield sol. materials decreases regularly from the surface to the water-table. The zone of weathering and the region of greatest activity closely coincide.

W. J. ROBBINS

Minnesota glacial soil studies. I. A comparison of soils on the late Wisconsin and Iowan drifts. CLAYTON O. ROST AND FREDERICK J. ALWAY. *Soil Sci.* 11, 161-205 (1921).—A comparison was made of the physical and chem. compn. of 3 soil types occurring on 2 adjacent drifts of similar original till but of different geologic age. No distinct differences between the two drifts were found in texture, or content of  $Si$ ,  $Al$ ,  $K$ ,  $Na$ ,  $Mg$ , non-carbonate lime,  $N$ , or org.  $C$ . The soils on the older drift are considerably richer in  $P_2O_5$  and contain appreciably more  $Fe$  and  $Ti$ . It would appear that the only distinct influence which the greater age of the Iowan drift has been able to exert upon the soils developed upon it is confined to the leaching out of carbonates to a greater depth and an enrichment of the surface layers in  $P_2O_5$ .

W. J. ROBBINS

The effect of continuous cropping upon the major soil nutrients. GUY R. STEWART. *Soil Sci.* 11, 321-3(1921).—Two sets of soils in containers holding 1800 lbs., one set very similar and consisting of 6 clay loams, the other dissimilar and consisting of 7 fine sandy loams have been cropped continuously. The average decrease in crop yield amounts to 35.2% for the straw and 34.4% for the grain. In 5 of the 7 sandy loams there has been a reduction of 30% or more of the sol.  $P$ , while only 2 of the clay loams have begun to show a decrease. Detns. before the soils were planted showed that the fine sandy loams contained 0.05-0.09%, the silty clay 0.13-0.18% of total  $N$ . At the close of 1919 all the soils both planted and fallow showed a reduction of 14-38% of their original total  $N$  content.

W. J. ROBBINS

Lime requirements and reaction of lime materials with soil. C. J. SCHOLLENBERGER. *Soil Sci.* 11, 261-76(1921).—Various lime materials were mixed with soil in undrained

pots and at intervals the residual  $\text{CO}_2$ , accumulated  $\text{NO}_2$  and lime requirement were detd. Approx.  $\frac{1}{2}$  of a 3.1 t. per acre application of relatively pure high Ca-limestone, calcite and magnesite was attacked within 4 weeks and  $\frac{1}{3}$  within 28 weeks. Dolomite was found to be about 50% more resistant, while pptd.  $\text{CaCO}_3$  was more readily attacked. "Dicalcium silicate" was found to react as readily as  $\text{CaCO}_3$  but blast-furnace slag was less reactive than any material used. Limestone ground to pass a 100-mesh sieve was utilized at nearly the same rate in an acid salt loam and an alkaline clay loam but  $\text{CO}_2$  disappeared more rapidly from an acid clay loam. The lime requirements by the vacuum method were comparable with the first two soils but twice as great with the third. The evidence indicates that the interaction of soil constituents and  $\text{CaCO}_3$  is sufficiently regular and quantitative for a lime requirement detd. by the reaction to be of practical utility. The lime requirement by the method used is affected considerably by the prepn. of the sample, the temp. and the time allowed for the detn. Heating is apparently not undesirable in detg. the lime requirement. W. J. R.

Soil analysis. K. ALB. VESTERBERG. *Svensk. Kem. Tid.* 33, 12-22(1921).—An address on the advances in soil chemistry. A. R. ROSS

A comparison of the technic recommended by various authors for quantitative bacteriological analysis of soil. ZAR NORTHERUP WYANT. *Soil Sci.* 11, 295-303(1921).—As a result of a study of the literature on methods for the quant. bacteriol. analysis of soil, recommendations are made. Not less than 10 g. of soil should be used in making the first diln. The initial diln. should be not less than 1-10. If the soil contains considerable org. matter it should be titrated in a mortar with a little of the dilg. liquid. In all cases the weighed soil sample should be made up to the vol. of the desired initial diln. Care should be taken in making further dilns. to transfer an aliquot of the soil itself. The 2nd diln. should contain not less than  $\frac{1}{10}$  of the amt. of soil in the first diln. Nos. of microorganisms should be estd. on the basis of over-dried soil.

W. J. ROBBINS

The amount of unfree water in soils at different moisture contents. GEORGE BOUYOCOS. *Soil Sci.* 11, 255-9(1921).—By the use of the dilatometer the amt. of unfree  $\text{H}_2\text{O}$  in 12 soils at different water contents was detd. The amt. of  $\text{H}_2\text{O}$  which soils are able to render unfree does not vary with the different moisture contents but appears to remain const.

W. J. ROBBINS

Employment of lime and powdered chalk to correct the acidity of the soil. RENE BERGE. *Compt. rend. acad. agr. France* 6, 934-38(1920).—Expts. show that the finer the lime the greater the yield when the lime is applied to acid soil. F. M. SCHERTZ

A preliminary study of ammonification and nitrification in Porto Rican soils. E. C. PALACIOS. *Rev. agr. Porto Rico* 5, 37(1921).—The ammonifying power of a typical soil of Porto Rico was studied by the usual incubation method, dried blood being used as a source of N. Nitrification was best in portions treated with  $\text{CaCO}_3$ . The soil studied is deficient in CaO. R. B. DEEMER

Sterilizing and disinfection of soil. P. WAGUET. *Inst. Agricole International, Beauvais. Rev. prod. chim.* 23, 655-8(1920); 24, 115-8, 183-7(1921).—A general review of our present knowledge of soil bacteriology, of its function in agriculture, and of the necessity of and methods employed for sterilizing and disinfecting soil, with particular emphasis on the work carried out during the last 5 or 6 yrs. A. P. -C.

A pitless lysimeter equipment. W. H. MACINTYRE AND C. H. MOORRS. *Soil Sci.* 11, 207-13(1921).—A lysimeter system not requiring a concrete enclosure and costing \$500 for a 12-unit system is described. It consists essentially of a pair of cylindrical iron tanks the inner of which holds the soil. Arrangements are made for removing the leachings from the outer tank by means of a pump. W. J. ROBBINS

The estimation of potash in soil and in fertilizers. HARALD R. CHRISTENSEN AND NIELS FRILBERG. *J. Landw. Versuchsstat.* 97, 27-56(1920).—Estns. were made,

on pure  $K_2SO_4$  soln., by means of Mitscherlich's (nitrite) method, a modified nitrite method and Zaleski's (nitrite) method. Research was then made on exts. of soil made by extg. with  $CO_2$ -satd. water and with HCl soln. The chloroplatinate method, when 96%  $C_2H_5OH$  was used, gave about the same results as the perchlorate method when tested on fertilizing salts. When NaCl was added the nitrite method gave very good results, but when NaCl was not added the results obtained were low as compared with the two other methods. If the solns. used in the nitrite detns. were first pptd. with  $BaCl_2$  and  $(NH_4)_2CO_3$  the results obtained were always low as compared with the chloroplatinate and the perchlorate methods.

F. M. SCHERTZ

The fertilizing action of carbon dioxide. *Juss. J. agr. prat.* 35, 229(1921).—A review principally of the work of Kreussler, Borneman and Riedel.

R. B. D.

Investigation of some dark colored samples of ammonium sulfate. A. E. BERKHOUT. *Arch. Suikerind.* 29, 147-53(1921).—These samples, representing shipments received during the war, did not contain arsenic, cyanogen or thiocyanogen compds. N was normal. The insol. matter was a little high, but did not contain much sand or clay. Water solns. of the samples were greenish black. They had a peculiar, narcotic odor, and were very low in free  $H_2SO_4$ . The dark color was found to be due to C particles, Fe, Fe compds., and tar. The odor was due to pyridine bases. The latter were detd. by a slight modification of Lambrie's method (*C. A.* 7, 2293); 0.56 to 2.12% were found. This has very little effect on the N found by distn. The high N in the samples was largely due to the fact that they had little free  $H_2SO_4$  and were, therefore, less hygroscopic. The pyridine bases in the fertilizer are not injurious to vegetation, because they are rapidly decompd. in the soil.

F. W. ZERBAN

The role of copper in basic Bordeaux mixture. H. HUYER. *J. agr. prat.* 35, 201(1921).—A note discussing Villedieu's work, who reports that CaO is the toxic agent in Bordeaux sprays, and not Cu. Two formulas are proposed: (1)  $Al_2(SO_4)_3$  1 kg. and fine lime 5 kg.; (2)  $Al_2(SO_4)_3$  1.5 kg. and fine lime 75 kg. in 26.4 gal.  $H_2O$ . Formula (2) is preferred. The thicker the spray the more resistant it is to the  $CO_2$  of the air.

R. B. DEEMER

The role of copper in basic Bordeaux sprays. P. VIALA. *Compt. rend. acad. agr. France* 7, 245-49(1921).—Expts. conducted with fungi lead the authors to adopt the following formula as a spray to take the place of copper spray: Prep. as ordinary Bordeaux spray a soln. of 1.5 kg. of  $Al_2(SO_4)_3$  and 7.5 kg. of fine lime in 100 l. of water.

F. M. SCHERTZ

Some soil fumigation experiments with *p*-dichlorobenzene for the control of the peach-tree borer, *Samoiniodes exitiosa* Say. ALVAH PETERSON. *Soil Sci.* 11, 305-19(1921).— $p$ - $C_6H_4Cl_2$  gives promise of becoming a valuable and important insecticide for the control of the peach-tree borer. If the soil temp. is 55-60° F. and the soil not too wet  $\frac{3}{4}$  to 1 oz. of  $p$ - $C_6H_4Cl_2$  will kill 90-100% of the borers. It can be safely used on trees 6 years of age or older. It should be applied in a narrow band about the base of the tree approx. 2 in. from the trunk. The material should be covered with several shovels of dirt.

W. J. ROBBINS

Treating whey; fertilizers (Brit. pat. 153,816) 12.

Phosphatic fertilizer. F. J. TROMP. U. S. 1,372,051, Mar. 22. Material such as natural minerals containing Fe or Al phosphates or both is treated with  $Na_2CO_3$  and lime together with  $H_2O$  to form a citrate-sol. phosphatic fertilizer. Not over 4 equiv. proportions of  $Na_2CO_3$  are used for each 20 equiv. proportions of  $P_2O_5$  present and not less than 30 parts CaO is employed for 20 parts  $P_2O_5$ .

Calcium superphosphate. A. MATHESON. Brit. 153,293, Aug. 28, 1919. A sol. Ca phosphate or a fertilizer containing it in admixt. with  $K_2SO_4$  is prepd. by calcining

alunite and passing the gaseous products into a tower or chamber containing phosphate with or without calcined alunite, water spray or steam being added if necessary. The calcination of the alunite may be effected in a closed retort at 700–800°. The reactions are completed after the product is stored. The gases arising from the calcination of alunite may be led over calcined alunite for the production of  $(\text{NH}_4)_2\text{SO}_4$  and alum; and the fertilizer containing sol, phosphate and potash is obtained by calcining as above described a mixt. of alunite and insol. phosphate.

Fertilizers from perchlorate explosives. DYNAMIT-AGT.-GES, FORM. ALFRED NOBEL AND Co. Ger. 321,878, Sept. 20, 1918. The explosive mixts. are lixiviated with solns. of potassium salts, and the resultant solns. evapd. to dryness. When, e. g., KCl solns. are employed, the resulting solns. will contain the entire  $\text{NH}_4\text{NO}_3$  but are entirely free from  $\text{KClO}_4$  and are adapted to be used for fertilizing purposes.

Antiseptic baths or dips for seeds. CHEMISCHER FABRIK LUDWIG MEYER. Ger. 320,919, Apr. 23, 1918.—Antiseptics not new in themselves are mixed with highly volatile liquids or with siccatives. The germinating power of the seeds is not impaired thereby, even when the antiseptic is used in more concd. form than heretofore. For that purpose may be employed, e. g., tar of vegetable or animal origin and light tar oil boiling below 150° or benzene hydrocarbons boiling below 150° or alcohol, in the proportion of 4:1, or anthracene oil, or phenol in the above mentioned mixing proportion; or oleates or resinates of Cu or other metals or rare earths mixed with benzene or alcohol in the proportion of 5:100. The seeds are moistened with the liquid. The evapn. may take place in the open air.

Sheep and cattle dips and washes. I. McDougall. Brit. 157,527, Oct. 11, 1919. A dil. soln. of an arsenious ester of glycerol is produced in the presence of excess of glycerol preferably by mixing glycerol and  $\text{As}_2\text{O}_3$ , and heating to obtain a viscous homogeneous white fluid, readily sol. in  $\text{H}_2\text{O}$  to a clear soln. that is independent in strength of the hardness of the  $\text{H}_2\text{O}$ . It is effective as applied to sheep and cattle, odorless, and non-irritant, and may be mixed with other materials such as coal-tar preps., e. g., cresol.

## 16—THE FERMENTATION INDUSTRIES

H. S. PAINÉ

The manufacture of alcohol during the war. M. GUA. *Ann. chim. sci. ind.* [1a-2a] 35-36, 134-40(1920).—A review. E. FIERTZ

The detrimental effect of heet saponin on alcoholic fermentation. JÁN SATAVA. *Chem. Listy* 14, 1-5(1920).—The difficulties in fermentation encountered in the distilleries while using diffusion or leached juices from heets were suspected to be partly due to the poisonous effect of saponin on the yeasts. The saponin used in these expts. was prepared according to Smolenski (*C. A.* 5, 2575). To a certain extent the action of saponin was found to be sp. Thus, *Sacch. ellipsoideus*, which in a pure juice started fermentation within 4-5 hrs., remained inactive for 12 hrs. when 0.004% of saponin was present. The same effect was produced in the case of *Sacch. pastorianus* with 0.008% of saponin. *Yeast D*, isolated from the diffusion juice, required 0.012%. Some yeasts were shown to have a power of adaptation to repeated small doses of saponin. The activity of saponin was checked somewhat by the presence of acid. The nature of the media in which the yeasts were to vegetate, especially their nutritive value, was found to be an influential factor on the resistance of the yeasts towards saponin. Fermentation in the diffusion juice was accelerated appreciably by allowing the juice to settle and filtering off the sludge, thus reducing the saponin content. Heat and acids aided in the pptn. of saponin. *Bacillus delbrücki* and a bacillus belonging to the *B. coli* group were resistant to about 10 times the dose required for yeasts.

JOHN M. KRNO

Slow development and rapid heating during the principal fermentation of corn mash. G. FORN. *Z. Spiritusind.* 44, 104(1921).—Slow rise of the first fermentation of corn mash and rapid heating during the principal stage are ascribed to an insufficient supply of nutriment for the yeast. A batch of 1000 l. should be seeded with 80-100 l. of yeast.

W. B. V.

The causes of low alcohol yield in corn distillation. G. FORN. *Z. Spiritusind.* 44, 65-6, 76-7(1921).—A review of accepted practice in distilleries utilizing corn.

W. B. V.

The testing of molasses as to its suitability for use in the distillery. ANON. *Brennerei-Ztg.* 1919, 1336; *Z. Zuckerind. czechoslov. Rep.* 44, 104(1920).—The sugar content is detd. by a fermentation test. For this test the molasses is dild. with water to 5-6 times its original vol. It is then slightly acidified with  $H_2SO_4$  and boiled. After cooling it is allowed to ferment at a temp. of 34-37.5° with the addition of 20 g. of yeast for each 100 g. of molasses. When the fermentation is completed, in about 48 hrs., the mixt. is subjected to distn. and the alc. content detd.

JOHN M. KRNO

Recovery of ethylene and ethyl alcohol from the gases of dry distillation (WÄRSE)  
21. Purification of cossette press waters and their utilization in the manufacture of yeast feeds (REINKE)28.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Matriculation sheets. A. SCHAMMELHOUT. *J. pharm. Belg.* 3, 82, 101, 215, 264 (1921).—Tentative monographs proposed for introduction into the Belgian National Formulary are submitted for the following items: cocaine, quinine hydrochlorosulfate, codeine, conline hydrobromide.

A. G. DuMEZ

Adulterated neoarsphenamine. WALTER DULIÈRE. *J. pharm. Belg.* 3, 241-2 (1921).—A sample of contraband material purported to be neoarsphenamine was found on analysis to consist of moisture, 11.80%; NaCl, 77.80%;  $Na_2CO_3$ , 7.84%;  $PbCrO_4$  and  $CaSO_4$ , 1.80%; undetd. material 0.76%.

A. G. DuMEZ

Alkaloidal and nitrogen content of belladonna extract. J. ORIENT. *Pharm. Monatshefte* 2, 17-19(1921).—In a series of expts. it is shown that exts. rich in alkaloids have relatively low N content, from which the conclusion is drawn that the excellence of Extr. Belladonnae depends not only on the alkaloidal content but also on the degree to which proteins are eliminated in prepg. the ext.

W. O. E.

Monographs on floral odors. I. Violet odor. P. P. R. *Perf. Essent. Oil Rec.* 12, 74-7(1921).—Attention is called to the fact that the chemistry of perfumes, in spite of its seemingly remarkable progress, is still in its infancy. The properties and use of ionone are discussed in connection with the probable and actual constituents of natural and artificial violet. Comprehensive directions are given for the prepn. of the more important violet perfumes.

W. O. E.

Oil of cubebs. C. T. BENNETT. *Perf. Essent. Oil Rec.* 12, 90(1921).—A description of a sample of this oil showing physical characters corresponding to the requirements of the British Pharm., but differing as to color and yielding with  $AcOH$  and  $HNO_3$  a distinct violet coloration indicative of gurjun balsam oil. The abnormality was finally shown to be due to the fact that the oil was distd. from genuine, but small and immature, fruits of cubebs.

W. O. E.

Testing castor oil. K. ALPERS. *Pharm. Ztg.* 66, 243-4(1921).—In examg 3 samples of this product it developed that, while satisfying most of the Ger. Pharm. requirements, a divergence was observed with respect to soly. in alc., namely, 1 pt. of the oil being

sol. only in 90% alc., the Pharm. limits being 85.8 to 87.35%. In view of this observation, a corresponding change is advocated in the next revision. W. O. E.

**Note on the origin of antiscorbutic sirup.** J. PERROT. *Bull. sci. pharmacol.* 28, 64-6(1921).—A description of an old formula proposed in 1683 for combating scurvy, the constituents of which are largely herbs. F. S. HAMMERT

**Chenopode vernifuge or Mexican tea.** A. CHEVALIER. *Bull. sci. pharmacol.* 28, 129-45(1921).—A complete review of the cultivation, botanical properties and action of *Chenopodium ambrosioides* L. F. S. HAMMERT

**Arsenobenzenes: their composition and toxicity.** F. DE MYTTENAERE, WITH MAGNUS AND VAN BORCKEL. *Bull. acad. roy. méd. Belg.* [5] 1, 104-14(1921).—A table is given showing the reactions given by neoarsphenamine (A), novarsenobenzol (B), and sulfarsenol (Pluchon and Lehnoff Wyld) (C) with acids, bases, and various reagents. A shows differences from B and C. Analyses of 5 samples of A showed the As:N ratio to be >1, the content of some other As compd. present varying from 3 to 11.8%. All contained an excess over the theory of Na and S and 2 were brought down to 20% As by admixt. with NaCl. C,  $[\text{NaOSO}_2\text{CH}_2\text{NH}(\text{HO})\text{C}_6\text{H}_4\text{As}]_n$ , varied irregularly, indicating more or less of the mono-substituted deriv. In an attempt to det. whether any relation existed between toxicity and the excess in the As:N ratio the "easily mineralizable" As was detd. by dissolving 1 g. in 100 cc.  $\text{H}_2\text{O}$ , heating to 85° with 10 cc. 30% HOAc, and keeping at 90° for 10 min. with occasional shaking. The soln. was cooled, filtered, heated to 70°, 5 cc. HCl were added and the whole was satd. with  $\text{H}_2\text{S}$ . After filtering warm, the ppt. was washed with  $\text{H}_2\text{S-H}_2\text{O}$ , digested with 20 cc.  $(\text{NH}_4)_2\text{CO}_3$  soln., washed, the liquid evapd. to about 5 cc., 0.5 cc. concd.  $\text{H}_2\text{SO}_4$  and 1 g. powdered  $\text{KMnO}_4$  were added and the procedure continued according to Lehmann, the I being titrated with 0.01 N  $\text{Na}_2\text{S}_2\text{O}_4$ . In this way various samples required from 5 to 22.8 cc. per g. and in general the toxicity was found to parallel the loosely bound As. Also, a sample requiring 8 cc. when freshly opened, used 25.5 cc. after turning brown. Control expts. showed that A, B, and C were not decompd. by digestion in this way with HOAc. To det. arsenoxide in A, B, C, or salvarsan: Shake 1 g. with 20 cc. abs. MeOH for 1 min., decant 10 cc. through a dry filter, wash with 10 cc. dry MeOH, and add 50 cc.  $\text{H}_2\text{O}$  and 10 cc. 0.1 N I to the filtrate. Then add another 10 cc. dry MeOH to the flask and proceed as before, the difference between the 2 titrations  $\times 4$  giving the amt. arsenoxide in 100 g., the theory being that both aliquots will contain the same amt., if any, of the sparingly sol. arseno compd., while the 1st contains 0.5, and the 2nd 0.25 of the easily sol. oxide. Results will be given in a later paper. It is concluded that mfrs. should be urged to try to attain at least greater uniformity of product. Since so many 0.8 g. ampoules were sent in as having produced toxic manifestations the question is raised as to whether this amt. *per se* may not often be too large a dose. Also in *J. Pharm. Belg.* 3, 289-94, 310. M. HENDLBERGER

**Review of therapeutic novelties made known during 1920, including specialties and nostrums.** S. RABOW. *Chem.-Ztg.* 45, 277-8, 302-3, 325-8(1921). E. H.

**Colloidal metals, their technical preparation and use.** J. REITSCHYER. *Oesterr. Chem.-Ztg.* 23, 144-47(1920).—A compilation on the basis of German patents of the colloidal metals and other colloidal substances, mostly organic salts of metals, which are used in therapy. H. I. MATTELL

**A suitable apparatus for filling ampoules.** CARL WOYTACK. Hamburg. *Chem.-Ztg.* 45, 221(1921); 1 cut.—The serum is poured into a dish and another dish with about 120 holes in the bottom is inverted over it. The ampoules are placed in the holes with the necks dipping into the serum. Two sets of dishes so prepared are placed under a bell-jar which is exhausted. On re-admitting air to the jar the serum is forced into the ampoules which are withdrawn from the holes, sealed and sterilized. J. H. M.



The residue from evaporating aetherol. terebinth. depuratum. I. A. ROY. *Svensk Farm. Tid.* 25, 117-9, 134-7(1921).—Data are presented supporting the contention that the evapn. test for the turpentine is too severe. Pure preps. give varying residues mostly in excess of that allowed. The test may well be omitted from the Pharm. Suec. II. J. G. B. *Ibid.* 137.—The tests referred to above become satisfactory if there is added some water to the turpentine before it is evapd. A. R. ROSK

Preparations of sirups. ERIC WINBERG. *Svensk Farm. Tid.* 25, 119-20(1921).—It is suggested that in the coming edition of the Pharm. Suec. 0.1% BzONa or 1% EtOH be prescribed as preservative for Sirup: Althaeae, Frangulae, Rhei, Sennae mannatt and Zingiberis and non-official sirups such as Scillitic, Papaveris, Violaceus and other syrups of similar types. Clarification is best effected by the addition of egg white and heating. The quantities necessary (in terms of dry albumin) are: for Althaeae, Rhei, Sennae mannatt, and Zingiberis 5 g; for Frangulae and Senegae 1 g. per kg. For berries (e. g. raspberries) use 5 g. per kg. A. R. ROSK

Aromatic grass oils. ANON. *Bull. Imp. Inst.* 18, 338-46(1920).—A sample of *citronella* oil from Seychelles was a pale yellow color of the following compn.:  $d_{15}^4$  0.881,  $[\alpha]_D^{20}$   $-28^\circ 30'$ ,  $n_D^{20}$  1.477, total acetylizable content (calcd. as geraniol) 52.2%, geraniol 27.5%, citronellal 24.7%, insol. in 80% EtOH at  $15^\circ$ . The oil was of a poor quality. A sample of *lemon grass* oil obtained from *Cymbopogon schoenanthus* gave the following results on analysis:  $d_{15}^4$  0.883,  $[\alpha]_D^{20}$   $-0^\circ 12'$ ,  $n_D^{20}$  1.486, citral 78.5%, insol. in 70% EtOH, sol. in 0.9 vol. 80% EtOH. A sample of *palm arosa* oil from India was light yellow in color and yielded the following results on examn.:  $d_{15}^4$  0.889,  $[\alpha]_D^{20}$   $-0.41^\circ$ ,  $n_D^{20}$  1.477, acid value 1.6, ester value 11.8, acetyl value 268.8, total alcohols (calcd. as geraniol) 90.7%, sol. in 1.8 vol. 70% EtOH. *Ginger grass* oil gave the following results an examn.:  $d_{15}^4$  0.910,  $[\alpha]_D^{20}$   $-15^\circ 48'$ , acid value 2.3, ester value 25.7, ester value after acetylation 170.5. The oil possessed a slight odor of citral. *Vetiver* oil from India was a dark brown oil and possessed the following consta.:  $d_{15}^4$  1.001,  $[\alpha]_D^{20}$  (oil too dark),  $n_D^{20}$  1.532, acid value 6.0, ester value 16.8. The sample compared favorably with the com. oil. R. L. SIBLEY

A new source of thymol. ANON. *Bull. Imp. Inst.* 18, 348-50(1920).—A sample of oil of the *Ocimum viride* was of a pale brown color and gave the following results on analysis:  $d_{15}^4$  0.910,  $[\alpha]_D^{20}$   $+0.75^\circ$ ,  $n_D^{20}$  1.497. There were 37% phenols present which consisted almost entirely of thymol. The yield of oil from the leaves was only 0.2%. R. L. SIBLEY

Spearmint from South Africa. ANON. *Bull. Imp. Inst.* 18, 350-1(1920).—Steam distn. of the leaves of the dried spearmint (*Menha longifolia*) yielded 2.4% volatile oil which was colorless and mobile. It was submitted to chem. examn. with the following results:  $d_{15}^4$  0.947,  $[\alpha]_D^{20}$   $-47.6^\circ$ ,  $n_D^{20}$  1.4925, ketones 70%. The ketones consisted largely of carvone. R. L. SIBLEY

Stability of ouabaine Arnaud. M. Tiffeneau. *Bull. acad. med.* 85, 187-9(1921).—The drug is uniform in compn. and when kept under proper conditions retains its activity. Why its toxicity differs from strophanthine (Merck) is not clear. G. H. S.

Rate of evaporation of ethyl chloride from oil (Baskerville, Hirsh) 11H. Colloidal arsenic (Külz) 11H.

BERNOULLI, E.: Uebersicht der neueren Arzneimittel. Basel: Benno Schwabe and Co. 173 pp. f. 3.60. For review see *Pharm. Weekblad* 58, 504(1921).

DELAECHE, MAURICE: Traité de chimie pharmaceutique organique. Paris: Gaston Doin. 200 pp. 16 fr. For review see *Ann. chim. anal. chim. appl.* 3, 131(1921).

Aurothiosalicylic acid. FARBERGK VORM. MEISTER, LUCIUS AND BRUNING. Brit.



and Mg were employed in the ratio of 1:1 at 750-850°, or 1.5:1 at 950°. The S was obtained almost entirely as SO<sub>2</sub>, with a little free S. Larger proportions of C did not cause complete reduction. II. Reduction of gypsum and anhydrite by carbon. With HANS FELD.—The reaction between gypsum and C below 500° proceeds very slowly, but is fairly rapid from about 700° upwards, the reaction proceeding according to the equation,  $\text{CaSO}_4 + 3\text{C} = \text{CaS} + \text{CO}_2 + 2\text{CO}$ . Similar results were obtained with SrSO<sub>4</sub> and BaSO<sub>4</sub>, while the indifferent behavior of MgSO<sub>4</sub> is explained by consideration of the heats of reaction. The compn. of the gaseous phase in the former cases is controlled by the C:CO:CO<sub>2</sub> equil., while in the case of MgSO<sub>4</sub> this is disturbed by the action of SO<sub>2</sub> on CO. III. The calcium sulfide-carbonate equilibrium. With FRI. ITALIENNER AND FRZ. M. HESSE.—CaS can not be decompd. according to the equil.,  $\text{CaS} + \text{H}_2\text{O} + \text{CO}_2 \rightleftharpoons \text{CaCO}_3 + \text{H}_2\text{S}$ , since CaS is formed to a considerable extent at temps. such as 700°, at which the equil. is sufficiently rapidly attained. IV. Reduction of gypsum and anhydrite by gases. With MARGARETE HESSE.—Reduction of gypsum by CH<sub>4</sub> took place according to the equation,  $\text{CaSO}_4 + \text{CH}_4 = \text{CaS} + \text{CO}_2 + 2\text{H}_2\text{O}$ . Dehydration of the gypsum occurred below 800°, but if the action be sufficiently prolonged at 800-1000°, quant. reduction appears possible. Some CaO was formed above 1100°, probably according to the equation  $\text{CaS} + \text{H}_2\text{O} = \text{CaO} + \text{H}_2\text{S}$ . Expts. showed that excess of steam favors complete removal of S at 1200-1300°. The S was obtained however almost entirely as SO<sub>2</sub> or free S, the latter predominating only when a slight excess of H<sub>2</sub>O was present. This was partly due to dissociation of H<sub>2</sub>S, and partly to its reaction with H<sub>2</sub>O vapor (cf. Randall and Bichowsky, *C. A.* 12, 555.). V. Decomposition of calcium sulfide by steam and the direct conversion of gypsum and anhydrite into oxide. With M. HESSE.—On treatment with C and steam at 1200°, CaSO<sub>4</sub> can be converted directly into CaO, while at 1300° the action proceeds 6 times as rapidly. On account of the reducing action of CO and H on SO<sub>2</sub>, the product consisted chiefly of elementary S, even when 850 times the theoretical amt. of steam was used. D. BREHSE JONES

Cottrell electrical precipitator installation at plant of the American Acid Co., Medford, Mass. W. J. KEE AND F. H. VIGGS. *Chem. Age (N. Y.)* 29, 71-4 (1921).—An illustrated description of a small plant for recovery of H<sub>2</sub>SO<sub>4</sub> from an acid concentrator, employing the well-known Cottrell process of elec. pptn., with 50,000 to 60,000 v., and a power consumption of 100 to 150 kw.-hrs. per day. 100% efficiency in cleaning is claimed. The time of construction was 2 months, and the cost \$15,000. W. C. EBAUGH

The Chamber process under tropical conditions. W. H. MAWDSLEY. *Chem. Trade J.* 68, 133-4 (1921).—The plant and operating conditions at Mount Morgan within the Tropic of Capricorn are described. The yield of acid on S burnt in April (winter) was 91.40%, in Nov. (summer) 86.60%. Strips of Pb suspended vertically in the chamber acid without contact with the chamber lead lost as high as 29.49% in 3 years. The "creeping" of the vertical lead sides of the chambers may be provided for by rolling the sheets thicker about 2 ft. from the end. JEROME ALEXANDER

New mechanical roasting ovens. B. SCHAFFRA. Vienna. *Chem. App.* 8, 41-4, 51-3 (1921); 4 cuts.—Descriptions of 3 ovens for roasting pyrites, etc., built by Erarost. G. m. b. H., on the general principle of the Herreshoff oven: (1) a 7-stage oven with air-cooled stirrers and special contrivance to reduce dust; (2) an installation of a Kaufman oven in a paper factory; (3) the Spirlet oven, built of hard-burned chamotte, with no Fe exposed to the action of the gases, with the stages so close together that the heat is conserved to such an extent that very little fuel is required (at most not over 10% of the wt. of the roasted ore) and the O in the air so thoroughly utilized that the exit gases contain 5-7% SO<sub>2</sub>. The hearths, except the top and bottom, revolve and the ore is transferred from 1 hearth to the next lower by means of teeth attached to the hearth above in such a way as to work the ore toward openings to the hearth below. The capacity of the experimental oven is 3-7 t. roasted ore per 24 hrs., but 1 of greater capacity

is now under construction. The hearths last 1-1.5 yr., and can be replaced while hot in case of emergency. There is very little dust in the gases. J. H. MOORE

Some interpretations of the ammonia synthesis equilibrium. R. S. TOUR. *J. Ind. Eng. Chem.* 13, 298-300(1921).—A graphic study of the  $\text{NH}_3$  equil. equation. Curves are given for graphic solution of equil. problems, and a nomograph for finding the % of  $\text{NH}_3$  for equil. at different temps. and pressures in a system containing no inert gas with N and H in theoretical proportion. J. J. MORGAN

The evaporation of aqua ammonia. E. B. AUERBACH AND L. MILLBRADY. *Z. angew. Chem.* 34, *Ausatzteil* 95-7(1921).—Because of its great volatility extreme precautions must be taken in sampling and analyzing  $\text{NH}_3$  solns. The effects of area exposed, time of evapn., decrease of wt. and changes in concn. under lab. conditions were followed by sp. gr. detns. but no account was taken of temp., humidity of atm., air movements, etc. The very rapid evapn. of  $\text{NH}_3$  in comparison with  $\text{H}_2\text{O}$  from com. solns. was striking and unexpected. During the first 3 days  $\text{NH}_3$  content diminished from 34.5, 25.7 and 22.7% in 3 samples to 6.2, 6.3 and 6.3%, resp., while the loss in water amounted to only 1 or 2 %. W. C. EBAUGH

Application of the vapor pressures of potassium compounds to the study of the recovery of potash by volatilization. DANIEL D. JACKSON AND JEROME J. MORGAN. *J. Ind. Eng. Chem.* 13, 292-5(1921).—Results are given of 87 quant. detns. of the volatilization of K from 15 mixts. of feldspar and of greensand with  $\text{CaCO}_3$ ,  $\text{Ca(OH)}_2$ , limestone,  $\text{CaCl}_2$  and  $\text{NaCl}$  at temps. between  $1050^\circ$  and  $1300^\circ$ . Conclusions drawn are: (1) Because of the high vapor pressure of KOH, K is volatilized more rapidly from greensand-lime mixts. than from feldspar-lime mixts. Water vapor in the gas phase aids volatilization from both mixts. (2) K is volatilized readily at  $1215^\circ$  from mixts. of either feldspar or greensand with  $\text{CaCl}_2$  and  $\text{CaO}$  if the  $\text{CaO}$  is in about the proportions used in Portland cement mixts. (3) Water vapor in the gas phase does not aid volatilization when sufficient chloride is present to form KCl. (4) K is volatilized from mixts. of greensand with  $1/3$  its weight of limestone and chloride sufficient to form KCl provided the mixture is heated slightly below its m. p. J. J. M.

Storage and handling of potash. G. F. ZIMMER. *Chem. Age* (London) 4, 34-7 (1921).—Potash salts, being mined continuously but marketed periodically, are stored at the mine. During this storage, the easily handled run of mine salt cakes into a solid mass, the reclaiming of which demands mechanical handling devices. Owing to the dust, which absorbs  $\text{H}_2\text{O}$  rapidly, becoming corrosive, the storehouses are built of timber or where necessary, steel enclosed in concrete. The storehouses are usually filled from the center of the roof by means of a band conveyor with throwoff carriage or trolley line with tipping skip. One type of reclaimer consists of a jib crane travelling longitudinally through the center of the store supported at bottom and guided at top by rails. The crane is fitted with a derrick carrying an endless scraper which may work at any angle, moving the salts downward to a central band conveyor beneath the floor. Capacity is 50 tons per hour. Another type consists of a portable 3-wheeled vehicle carrying a vertical upward cutting endless bucket elevator suspended from a jib and therefore movable relative to the vehicle. The elevator discharges onto a short band conveyor, thence to a shoot, all supported on the vehicle. The salt falls on a portable screw conveyor self-propelled on the storehouse floor, thence to a stationary bucket elevator to loading tower, thence through special devices to all portions of the box-car floor. Power supply to all devices is through flexible leads from wall plugs. A later type requiring the services of but one man to handle 100 tons per hour consists of a vertical upward cutting endless bucket dredger suspended from a travelling crane near the roof. The crane structure carries in addition a band or screw conveyor. The dredger is capable of movement crosswise on the crane and with upper end fixed, lower end may be raised so that dredger may work at any angle between the vertical

and horizontal. The reclaimed salt is removed upward, passing to the horizontal conveyor, thence to loading bins. The latest development consists of a reclaiming machine supported on rails on the floor of the storehouse, with the vertical cutting bucket dredger as an integral part of the same. The dredger cutting upwards discharges onto a transverse hand conveyor carried within the machine, which in turn discharges onto a central longitudinal band conveyor sunk beneath the floor level. This outfit is automatic in operation, the dredger taking its cuts across and return when the whole machine moves forward. Thirteen figures are given.

C. C. HERITAGE

**The sodium sulfide industry.** E. CRIVELLI. *Ann. chim. sci. ind.* [1a-2a] 35-6, 140-53(1920).—Review.

E. FIERTZ

**The rotative precipitant and the nitrate industry.** DIAZ OSSA. *Caliche* 1, 121(1919).—Analysis of the claims of Charme (Chilean patent No. 3822) which assert the discovery of a reagent capable of selectively pptg. nitrate from soln. in the presence of other salts. The assertions appear doubtful and even if true would probably have no significance in the industry although perhaps of utility in the lab. The author points out the disadvantages of any cold leaching method for caliche as compared with present hot leaching methods as lying in the slow rate of soln. of the nitrate, the technical impracticability of obtaining solns. stronger than 200 g. nitrate per liter as compared with 800 p. p. l. in the hot method and the greatly increased labor necessary owing to the larger volumes of solns. required.

C. L. BURDICK

**Reflections upon nitrate technology.** LUDOVICO PERRONI. *Caliche* 1, 124(1919); cf. C. A. 15, 414.—The belief is expressed that in spite of a probable great world demand for fixed N at least 20% of the Chilean production will not be able to maintain itself against synthetic competition during the immediate future. To maintain that portion of the present government income derived from nitrate exportation it is recommended that the government open to immediate exploitation all possible rich nitrate fields and that energetic pressure be brought to bear on the association of producers to force them to follow a policy of technical progress.

C. L. BURDICK

**Progress of nitrate technology.** MOISES ASTORECA. *Caliche* 1, 161(1919).—A detailed description of the various improvements and new methods in actual application or attempted application on a large scale in the nitrate industry.

C. L. BURDICK

**The Duviensart process for manufacture of nitrate.** RENE GUILLIER. *Caliche* 1, 170 (1919).—The leaching process of this method for treating caliche contemplates a countercurrent percolation effect at moderate temps. in which the solns. dissolving nitrate from the caliche ppt. a portion of their chloride and thus cement together and eliminate as such the fines heretofore troublesome. The crystn. is effected by alternate steps of evapn. and cooling accomplished by means of spraying the solns. through rising currents of warm gases in towers of appropriate form. The hot gases are utilized in preheating fresh charges of caliche.

C. L. BURDICK

**Vocabulary of nitrate technology.** ALEJANDRO BENTRAND. *Caliche* 1, 217(1919).—A compilation of the technical terms and phrases used in the nitrate industry.

C. L. BURDICK

**The iodine industry in Chile.** B. DIAZ OSSA. *Caliche* 1, 269(1919).—Detailed discussion of the chemistry, technology and costs of iodine production.

C. L. BURDICK

**The manufacture of poison gases during the war.** F. GARELLI. *Ann. chim. sci. ind.* (1a-2a) 35-6, 63-90(1920).—A review.

E. FIERTZ

**State legislation and carbon black manufacture.** A. F. KITCHEL. *Chem. Age* (N. Y.) 29, 62-4(1921).—The importance of C-black in making printing inks, rubber products, paints, etc., is stated, the economies resulting from absorbing all gasoline from the natural gas before it is used for making C-black are pointed out, and the actual (though

not superficially evident) efficiency of present processes of manuf. is emphasized. Interference with the industry by legislation, in the name of conservation, is therefore opposed by industries now using C-black.

W. C. EBAUGH

**Bakelite.** A. MARCIA. *Ann. chim. sci. ind.* (1a-2a) 35-6, 54-62 (1920).—A review.

E. FIERTZ

**Observations on phenol-formaldehyde condensation products.** WALTHER HERZOG. *Z. angew. Chem.* 34, Aufsatzteil, 97 (1921).—For the customary decompn. of phenol-formaldehyde condensation products (with alkalies) a dry distn. of the finely divided sample in a current of N, condensation of phenols, dihn. to known vol., and detn. by ordinary methods were substituted. Well washed material (Invelith) gave 17.9% of phenol content, while other makes yielded from 20 to 26%. In the distn. bulb 40 to 50% of a brown to black residue was left. Evidently 18% of phenol comes from the mol. combination, and phenol in excess of this amt. from adsorption. It appears that in these products about 80 to 85% of the phenols are held firmly in combination, and about 15% more loosely, probably in the form of a phenyl ether,  $-O-C_6H_5$ .

W. C. EBAUGH

**Talc and soapstone in 1919.** J. S. DILLER. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 265-8 (Preprint No. 18, published Apr. 14, 1921).

E. H.

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Treating sulfate solutions from ores (U. S. pat. 1,370,646) 9.

KOSMANN, HANS BERNHARD: *Der Löschkalk und die Kalkmilch*. Berlin: Verlag der Tonind.-Ztg. 20 pp. M. 240. For review see *Tonind.-Ztg.* 45, 166 (1921).

MAXTON, E. B.: *Ammonia and the Nitrides*. London: J. and A. Churchill. 7s. 6d. net. For review see *Chem. Trade J.* 63, 349 (1921).

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**Sulfuric acid.** A. HELBRONNER. *Brit.* 157,281, Jan. 10, 1921.  $H_2SO_4$  is produced and concd. in an app. which resembles a "horizontal Glover-tower."

**Sulfuric acid chambers.** M. H. KALTENBACH. *Brit.* 159,156, July 29, 1920. In the manuf. of  $H_2SO_4$ , the usual Pb chambers are replaced by one or more series of parallel tubes of relatively small diameter, packed with filling and provided with water jackets. Hot burner gases leaving the Glover tower pass through the series of tubes, etc., and finally reach the Gay-Lussac tower. By means of dampers any particular tube may be disconnected from the system and the temp. of the reaction is completely controlled, by the regulation of the flow of  $H_2O$  through the jackets and by the adjustment of the temp. of the acid used for irrigating the tubes, by means of coils. A suitable construction is specified.

**Catalyst for making sulfur trioxide.** F. SLAMA and H. WOLF. U. S. 1,371,004, Mar. 8. A catalyst for use in oxidizing  $SO_2$  to  $SO_3$  is formed by treating finely divided pumice or kieselguhr or other suitable carrier with  $NH_3$ , vanadate and calcining to drive off  $NH_3$ . The particles of the carrier should have a diameter of 60 microns or less. With this catalyst a 96% conversion of  $SO_2$  into  $SO_3$  may be attained. K vanadate also may be used and the addition of NaOH or KOH in forming the catalyst may improve its properties. The catalyst may be mixed with a binder and molded and then treated with a gas containing  $SO_2$ , which improves the bonding of the small particles and renders the catalyst more stable.

**Preparation of alkali sulfate and sulfuric acid from bisulfate.** FARBENFABR. VORM. FRÖHN. BAYER & Co. Ger. 297,231, Mar. 14, 1916. It is not new that alkali bisulfate when heated to relatively high temps. decomposes into sulfate,  $SO_2$ , and  $H_2O$ . But it has heretofore not been possible to conduct this reaction successfully owing to the low power of resistance of the materials employed, namely, Fe and chamotte. Expts.

have shown that alkali bisulfate, without any addition and in any form whatever, may be split quant. into its constituents in rotary tubular furnaces commonly employed in the cement industry. The furnace lining is only slightly attacked thereby. The mode of firing has no effect; incrustation of the furnace is prevented by building a scraper or raker into it.

**Utilizing waste gases from the concentration of sulfuric acid.** HUGO PETERSON. Ger. 302,534, Feb. 23, 1917. The waste gases, consisting of steam and  $H_2SO_4$  in gaseous or mixed form, are passed, in place of  $H_2O$  or steam, into the Pb chambers employed in  $H_2SO_4$  manuf. To reduce the heat carried along by the waste gases and harmfully affecting the Pb chamber process, the waste gases are first brought into contact with cold  $H_2SO_4$ . The acid is at the same time partially concd. The nitric oxides which pass into the waste gases in the concn. of nitrous  $H_2SO_4$  thus also enter the chambers and are there utilized for the process. Instead of being passed into the chambers, the waste gases may be introduced into towers in which a process of formation of  $H_2SO_4$  is effected.

**Preparation of nitric oxides from air or other mixtures of nitrogen and oxygen.** CARL ROSSI. Ger. 321,287, July 17, 1913. Since the oxides of many metals decompose nitric oxides, the nature of the electrode metal is highly important. Especially the oxides of the Fe, Mn, Sn and Cu group show this action; e. g., 0.001% of  $Fe_2O_3$  is sufficient to cause the decompn. of NO produced by the electrothermic process. On the other hand, "silicon oxide," by itself or alloyed with Al, is indifferent to NO and, therefore, particularly suitable as electrode material.

**Nitrogen fixation.** R. PEARSON. U. S. 1,372,541, Mar. 22. Air or mixts. of N and O are subjected to the joint action of elec. sparks and a catalyst, e. g., platinized asbestos, at a temp. above  $300^\circ$  while passing through the catalyst in proximity to the elec. sparks.

**Nitrogen oxides from calcium cyanamide and similar materials.** A. H. WHITT. U. S. 1,370,867, Mar. 8. In generating  $NH_3$  by the autoclave treatment with NaOH soln. of calcium cyanamide, cyanides or nitrides, the first portion of the ammonia "run" is used for the production of aqua ammonia or other purposes and the latter stages of the "run" are employed for oxidation with the aid of usual catalysts to obtain N oxides and  $HNO_3$ . The impurities generated, which constitute poisons to the catalyst, including such compds. as  $C_2H_2$ , Si hydrides and  $PH_3$ , are principally evolved with the first portions of the  $NH_3$  generated.

**Vanadium oxides.** P. A. MACKAY. Brit. 157,555, Oct. 18, 1919. V ores are treated with oleum and the soln. is reduced for instance by  $SO_2$  or HCl, or a carbonaceous reducing agent may be added to liberate  $SO_2$  from the soln., or in case Cl is present in the ore an added reducing agent may be unnecessary. The soln. is then dild. with  $H_2O$  and the  $PbSO_4$  sepd., leaving vanadyl sulfate in soln. The vanadyl sulfate may be neutralized to ppt. hypovanadic acid, or an oxidizing agent such as alkali permanganate may be added to obtain vanadic anhydride, or the soln. may be electrolyzed in a diaphragm cell, when vanadic anhydride seps. at the anode and a lower oxide at the cathode.

**Purifying arsenic trioxide.** C. P. LINVILLE. U. S. 1,372,443, Mar. 22. Coloring matter is removed from  $As_2O_3$  which contains Se by treatment with Ag, Cu, Au, Fe or Pb to produce a selenide, which is relatively non-volatile, and the  $As_2O_3$  is then sepd. by fractional volatilization.

**Hydrogen sulfide.** J. G. MACLEOD. Brit. 158,238, July 31, 1919. The  $SO_2$  and  $SO_3$  contained in gases obtained in the combustion, calcination, and distn. of sulfide ores and other S-containing materials, are reduced to  $H_2S$  by a process in which the incandescent carbonaceous zone in which reduction takes place is maintained at the requisite temp. exclusively by the combustion of the carbonaceous matter with O contained in the gases and added to them, the latter being suitably regulated. The process

is continuous, and the necessary H is derived from the moisture in the reaction gases or added to them, or from the carbonaceous material.

**Recovery of dry ammonia from calcium cyanamide.** ERNST WIEDERMANN. Ger. 321,204, May 23, 1914. (Addition to No. 311, 959.) According to the main patent for the purpose of producing a large reaction surface the material is kept continuously in vortex motion by means of a conveyer worm capable of being heated, the material being thus heated according to the countercurrent principle and at the same time treated with superheated steam. According to the present invention, a multistage furnace capable of being heated and fitted with suitable agitating app. is employed. Into this the CaNCN is introduced from the top, while from the bottom superheated steam is passed in, which meets the descending reaction material in countercurrent. By regulation of the steam supply, the CaNCN may be quant. hydrolyzed. The perfectly dry  $\text{NH}_3$  liberated may be drawn off from the top by suction. The hot  $\text{CaCO}_3$  formed drops from the lowest stage of the furnace through an inclined channel into a worm washed all around by cold water and is thus removed from the process.

**Ammonia from cyanides.** AKTIESELSKABET KVÆLVINDUSTRIEN. Ger. 321,662, June 18, 1919. Cyanides obtained by the reaction of C with alkali or alk. earth metals or compds. in a current of N are decompd. by water for the purpose of obtaining ammonia. The impurities contained in the residue of such decompn. mass consist of silicic acid, alumina or the like bound to alkali metals or alkaline earth metals. They are decompd. by means of a suitable acid which is stronger than the acid impurities and which must contain only O, H, C or N; or, in the case of alkali compds., the impurities may be decompd. by  $\text{CaO}$ , and thus sepd. as insol. Ca silicate, aluminate, etc., while the sol. constituents are used again for the cyanide process. The cheapest acid for this purpose is  $\text{CO}_2$ , which is preferably passed in at relatively high temp. and pressure, so that the ppt. of silicic acid will become pulverous and can thus be more easily removed. When alk. earths are a constituent of the reaction mass, formic acid or  $\text{HOAc}$  should be used. By  $\text{HOAc}$  the alk. earths are converted into acetate; the silicic acid is pptd. and filtered off. The soln. is evapd., and upon heating, the acetates are converted into carbonates.

**Ammonia.** P. BRAT. Brit. 157,745, Jan. 10, 1921.  $\text{NH}_3$  is obtained from peat by heating with  $\text{CaO}$  in a closed vessel at six atms. pressure. The steam evolved may be used for power purposes. If the process is carried on until the residue contains about 10–15% of  $\text{H}_2\text{O}$  and a hydrocarbon of high b. p. such as brown-coal-tar pitch (b.  $300^\circ$ ) is added, hydrocarbon oils are obtained by distg. at  $300\text{--}350^\circ$ .

**Ammonia.** P. BRAT. Brit. 157,746, Jan. 10, 1921.  $\text{NH}_3$  is obtained by heating raw or dried peat with "a strong soln. of Na" in a closed vessel at  $170\text{--}200^\circ$  under six atms. pressure.

**French oxide.** J. A. SINGMASTER. U. S. 1,372,462, Mar. 22. In making French oxide by the retort volatilizing process, the operation is carried out in a substantially continuous manner by charging molten Zn into the retort from time to time while the retort still contains molten Zn previously charged to make up for that which has been volatilized.

**Zinc oxide.** W. L. COURSEN. U. S. 1,372,466, Mar. 22. In producing French oxide by the retort volatilization process, a substantial body of molten Zn is maintained in the retort and additional Zn in solid form is added from time to time to make up for that volatilized.

**Tin oxide and zinc oxide.** D. DE ROS. U. S. 1,372,407, Mar. 22. In the production of oxides of Sn or Zn, an oxidizing blast is applied to a mass of molten Sn or Zn and the heat from the exothermic reaction is utilized. A primary blast is submerged in the molten metal and a secondary blast is provided in an adjacent position to suit varying requirements, above the surface of the material.



**Alumina; aluminum chloride.** S. E. SIGURIN. Brit. 159,086, Jan. 19, 1920. In the production of  $Al_2O_3$  by the calcination of crystals of  $AlCl_3$ , before they are removed from the satn. vessel, after the pptn. of the crystals, the  $AlCl_3$  soln. is passed from below into the vessel containing the crystals, which latter, together with the  $AlCl_3$  soln., are withdrawn from the bottom and sepd., *e. g.*, by means of centrifugal action. The  $HCl$  is recovered from the displaced mother liquor by distg. with  $H_2SO_4$ , and is used for pptg. the  $AlCl_3$  or is dissolved in  $H_2O$  for the dissolution of fresh aluminous material. The  $H_2SO_4$  is concd. for re-use and may be periodically freed from  $Fe$  sulfate, which is present as impurity, by cooling.

**Aluminium chloride.** E. C. BAUM and D. C. JONES. U. S. 1,372,332, Mar. 22.  $AlCl_3$  is produced by the action of gaseous  $Cl$  on  $AlN$ , preferably at a temp. of about 600-900°.

**Preparation of aluminium compounds.** DET NORSKE AKTIESELSKAB FOR ELEKTROKEMISK INDUSTRI, NORSKE INDUSTRI-HYPOTEKBANK. Norw. 30,824, June 21, 1920. Prehnite or prehnite-containing rock is disintegrated with mineral acids in dil. or gaseous state.

**Preparation of aluminium compounds poor in iron.** DET NORSKE AKTIESELSKAB FOR ELEKTROKEMISK INDUSTRI, NORSKE INDUSTRI-HYPOTEKBANK. Norw. 30,823, June 21, 1920. Plagioclase rock of the series of Labrador rock or anorthite rock or other materials rich in plagioclase are treated with acid gases or vapors.

**Tin and tin salts.** J. J. COLLINS. Brit. 159,071, Dec. 10, 1919. Tin-bearing rocks having a small content of  $SnO_2$ , or "tailings" left after the mechanical sepn. of  $SnO_2$ , are reduced by suitable gases, and the resulting metallic  $Sn$ , associated with a large quantity of gang, is subjected to the action of anhydrous  $Cl$ , preferably discharged from the liquid condition. By thus using an ore in which  $Sn$  may be 4% or less, the heat generated by the action of the  $Cl$  is maintained within controllable limits. The reaction vessel may also be provided with a jacket through which a cooling medium may be circulated in order to maintain approx. atm. temp. The  $SnCl_4$  thus produced is sepd. by leaching with a solvent such as warm  $H_2O$  or  $NaOH$  soln., by distn. preferably at reduced pressure, or by blowing hot air on the heated mass. The volatilized  $SnCl_4$  is condensed in  $H_2O$  and the hydrated chloride used to prepare other  $Sn$  salts or metallic  $Sn$ . The latter is extd. by passing the soln. of  $SnCl_4$  into a series of boxes each containing  $Zn$  turnings; spongy  $Sn$  is pptd. while  $ZnCl_2$  free from  $Sn$  collects in the last box. The addition of a small amt. of  $SnCl_4$  facilitates the beginning of the reaction between the metallic  $Sn$  and the  $Cl$ , and if the ore contains arsenic or  $S$  these are removed by roasting before the reduction of the  $SnO_2$ .

**Lead sulfate.** P. A. MACKAY. Brit. 157,554, Oct. 18, 1919.  $PbSO_4$  is obtained by treating  $PbS$  ores free from  $Zn$ , preferably galena, with oleum, which may be in excess, without any external heating. The reaction vessel should be insulated to avoid loss of heat. When an excess of oleum is employed, the sulfate is pptd. by diln. with  $H_2O$ , and the excess acid may be recovered. Cf. 154, 718 (C. A. 15, 1196).

**Preparation of anhydrous magnesium or calcium chloride.** EDGAR ARTHUR ASHCROFT. Ger. 321,256, Sept. 8, 1917. For the treatment of a  $Mg$  or  $Ca$  compd. with  $Cl$ , a fused medium is used in the presence of a catalyzer acting as  $Cl$  carrier. In addition to the catalyzer,  $C$  or any other substance stimulating the exothermic reaction is introduced into the reaction mass. The catalyzer is subsequently sepd. out by distn. or evapn. of the higher chlorides of the metal formed. The vapors thus produced are used as catalyzer for the next operation. After the supply of  $Cl$  gas has been cut off, dry air,  $O$  gas or other gaseous oxidizing agent is blown into the reaction mass for combustion of the  $C$  and maintenance of the heat of the reaction material, to sep. volatile impurities.

**Ammonium sulfate; sodium sulfate.** SOC. INDUSTRIELLE DE PRODUITS CHIMIQUES.

Brit. 158,382, Jan. 6, 1919. Addition to 136,833 (C. A. 14, 1192). In sepr.  $\text{NaNH}_2\text{SO}_4$  as described in the principal patent, the double salt is freed from its water of crystn. before treatment. The  $(\text{NH}_4)_2\text{SO}_4$  obtained by crystn. is freed from  $\text{Na}_2\text{SO}_4$  by washing it at about  $60^\circ$  with a soln. satd. in the cold with  $\text{Na}_2\text{SO}_4$  and  $(\text{NH}_4)_2\text{SO}_4$ . The wash liquor is cooled to sep. the double salt, and the mother liquor, to which a small addition of  $(\text{NH}_4)_2\text{SO}_4$  may be made, is again used as wash liquor.

**Calcium carbonate.** L. ROONV. U. S. 1,372,193, Mar. 22.  $\text{CaCO}_3$  is prepd. by atomizing milk of lime and causing the mist thus formed to react with  $\text{CO}_2$ .

**Recovering potassium salts from composite saline solutions.** C. E. DOLBEAR. U. S. 1,373,179, Mar. 29. Solutions such as Searles Lake water containing compds. of K and compds. of B are treated with an Al compd. such as  $\text{Al}_2(\text{SO}_4)_3$  to ppt. the B and the remaining soln. is then treated for the recovery of K compds.  $\text{Al}_2(\text{SO}_4)_3$  may be regenerated by treating the pptd.  $\text{Al}_2(\text{B}_4\text{O}_7)_2$  with  $\text{H}_2\text{SO}_4$ .

**Mercuric chloride.** C. SCHANTZ. U. S. 1,373,357, Mar. 29.  $\text{HgCl}_2$  is formed by passing Hg in liquid shower form through an atm. of Cl into a bath of liquid such as hot  $\text{HgCl}_2$  soln. which is not an active absorbent of Cl. A rotating drum with longitudinal interior baffles may be used as the reaction chamber.

**Extracting soluble salts from mixtures.** J. W. HORNSEY. U. S. 1,373,731, Apr. 5. In extg. sol. salts from raw materials, e. g., in the extn. of  $\text{NaNO}_3$  from Chile salt-peter, the material is treated countercurrent-wise with a mother liquor containing up to satn. other sol. ingredients associated with the salt to be extd. in the raw material, and, after energetic agitation, the liquid is removed from a quiet zone.

**Alkali borates.** A. A. KELLY and B. D. JONES. Brit. 158,992, Nov. 15, 1919. Alkali pentaborates are produced by treating with  $\text{CO}_2$  a mixt. of a boron ore and  $\text{H}_2\text{O}$  with the addition of a sufficient quantity of an alkali hydroxide or carbonate to ensure the presence of 1 mol. of alkali metal oxide to 5 mols. of  $\text{H}_3\text{BO}_3$ . In the examples, borotrocalcite with the addition of  $\text{Na}_2\text{CO}_3$  is treated with  $\text{CO}_2$ ; colemanite with the addition of  $\text{NaOH}$  or  $\text{Na}_2\text{CO}_3$  is treated with  $\text{CO}_2$  in an autoclave at  $100^\circ$  and 50 lb. pressure. When the reaction is completed the excess of  $\text{CO}_2$  is boiled off, the soln. filtered and concd., and the pentaborate crystd. out. The pentaborate soln. may be treated with acid such as  $\text{H}_2\text{SO}_4$  and (or)  $\text{NaHSO}_4$  or with the requisite quantity of an alkali, boric acid or borax, resp., being obtained.

**Flaky alkali-metal silicate mixture.** A. A. DUNHAM. U. S. 1,373,224, Mar. 29. A dry porous flaky material adapted for use with *casein glue* is formed of casein and an alkali-metal silicate, in the proportions of about 2-10 and 98-90%, resp.

**Sodium bicarbonate; hydrogen.** NITROGEN CORPORATION. Brit. 158,863, Sept. 2, 1920.— $\text{NaHCO}_3$  and H are obtained in a modified  $\text{NH}_3$ - $\text{Na}_2\text{CO}_3$  process by using  $\text{CO}_2$  mixed with H as a diluent instead of with N. The required gaseous mixt. is preferably prepd. by passing water gas together with steam over a catalyst at an elevated temp. in the known manner, to convert the CO to  $\text{CO}_2$ . In practice, it is found necessary to remove the small quantity of  $\text{H}_2\text{S}$  in the water-gas before the oxidation of the CO. This is effected by passing it through one or more of the Solvay carbonating towers, which are thereby protected at the same time by the resulting  $\text{FeS}_2$  deposited upon them. The issuing gases are then passed through the contact chamber and the resulting  $\text{CO}_2$  and H bubbled through a second series of carbonating towers to ppt.  $\text{NaHCO}_3$ . The unabsorbed gas consists of substantially pure H and is used in the synthesis of  $\text{NH}_3$ . The water gas may be enriched with  $\text{CO}_2$  obtained by calcining the  $\text{NaHCO}_3$  after removal of the water vapor present, by condensation.

**Retort carbon; hydrogen.** I. SZARVASY. Brit. 158,891, Feb. 7, 1921. Pure retort-C produced by decomposing methane is deposited on pieces of C obtained in a previous operation. The decompn. is preferably effected in a tube-furnace inclined slightly to the horizontal so that the C filling fed in at the upper end is discharged automatically

at the lower when the tube is rotated. The pieces are thus also kept in motion so that they do not become joined together by the C deposited. The tube is heated internally either by the passage of an elec. current, or by burning therein H or some of the methane, when an oxidizing gas such as air must be supplied. The heating of the tube, when this is done by combustion of H or methane, and the decompn. of the methane is effected alternately. The H produced by the decompn. is used to heat the methane before it is supplied to the furnace.

**Carbon.** I. SZARVASY. Brit. 158,889, Feb. 7, 1921. Finely divided C, suitable for use as a pigment or as an absorbing or adsorbing agent, is obtained by the thermal decompn. of methane previously dild. with a neutral gas, such as N, H, or CO<sub>2</sub>, which does not itself deposit C.

**Graphitizing carbon.** I. SZARVASY. Brit. 158,888, Feb. 7, 1921. Preformed C bodies such as C electrodes are graphitized by heating in an atm. of methane to a temp. at which the methane decomposes; the heating may be carried out externally, for instance by gas, or internally electrically, the C bodies being embedded in C "grit" previously produced by decomposing methane. The carbon "grit" increases in quantity during the process and may be used as raw material for the production of C electrodes. By dild. of the methane with indifferent gases the temp. required for the graphitization is lowered.

**Mixture for removing carbon deposits from metal surfaces.** R. R. CHAMPLIN. U.S. 1,372,639, Mar. 22. A mixt. adapted for removing C deposits from internal-combustion engines is formed of alc. 4 oz., benzine 1 oz., kerosene 1 oz., H<sub>2</sub>O 12 oz., to which are added camphor 0.5 oz., NaOH 1 oz. and Na<sub>2</sub>CO<sub>3</sub> 1 oz.

**Decolorizing agent for liquids.** CATLIN SHALE PRODUCTS CO. Brit. 157,393, Jan. 10, 1921. A silico-carbonaceous material for decolorizing *sugar solns.* and other liquids is obtained by the limited treatment with H<sub>2</sub>F<sub>2</sub> of the carbonaceous residue of a technical carbonizing process, *e. g.*, shale distn.; the raw material is finely ground, and is treated with dil. acid preferably of 16% strength. The properties and yield of the product depend on the proportion and strength of the acid, and the duration of the treatment depends on the strength of the acid, and whether or not the materials are agitated.

**Rendering stable hydrogen peroxide solutions.** ALFRED QUEISSER. Ger. 321,616, Apr. 20, 1919. Water-sol. complex salts of salicylic acid are added to H<sub>2</sub>O<sub>2</sub> solns. The conversion of the salicylic acid into a complex salt may be effected by triturating in a mortar calcd. amts. of salicylic acid with Na<sub>2</sub>HPO<sub>4</sub> and a little water. Any given amts. of this salt may be dissolved in the H<sub>2</sub>O<sub>2</sub> soln. It is stated absolutely to prevent the decompn. of the H<sub>2</sub>O<sub>2</sub>, even in presence of organic substances, which is highly important in connection with the prepn. of pastes, salves and the like containing H<sub>2</sub>O<sub>2</sub>. In place of phosphates, borax may be used.

**Deflocculating materials.** F. G. ACHESON. Brit. 157,887, Dec. 13, 1920. See U. S., 1,345,306 (C. A. 14, 2535).

**Sizes.** F. POLLAK. Brit. 157,416, Jan. 10, 1921. The condensation products of urea or its derivs. or thiourea with HCHO are used for stiffening writing paper or fibrous materials such as hats, or for coating photographs with a thin mat. The compds. are employed in aq. soln., to which borax may be added; and the material, after being impregnated or coated with the soln., is heated to remove the H<sub>2</sub>O.

**Paste-like detergent.** CHEMISCHE WERKE MÜNCHEN OTTO BARLOCHER. Ger. 318,151. May 4, 1918. (Addition to No. 314,909.) The process of the principal patent is modified in so far as the NaHCO<sub>3</sub> suspended in H<sub>2</sub>O is passed slowly in a fine jet into a mixing or conveying machine or an engine fitted with blades or paddle wheels and working at a high rate of rotation, in which circulates water-glass uniformly mixed with Mg(OH)<sub>2</sub>. The introduction of the NaHCO<sub>3</sub> is preferably effected under pressure. CO<sub>2</sub> may be substituted for the NaHCO<sub>3</sub>.

**Soap substitute.** ALBERT STUTZER. Ger. 320,048, Mar. 27, 1918. The foots of potash works heated to 70 to 80° are treated with a certain amt. of milk of lime freed of the coarser particles, such amt. being considerably less than equiv. to the Mg content of the foots (for 1000 liters of foots, preferably 55 to 65 kg. of  $\text{Ca}(\text{OH})_2$ ). Or the foots, heated to 70–80°, may first be mixed with so much of a readily sol. Ca salt, preferably  $\text{CaCl}_2$ , as is necessary to sep. out, in the form of gypsum, the sulfate contained in the foots, whereupon the gypsum is sepd. by filtration from the liquid, and the latter then treated with milk of lime.

**Washing and scouring agent.** STAHLCKER AND CO. Ger. 320,940, Jan. 1, 1918. This agent consists of  $\text{Na}_2\text{CO}_3$ ,  $\text{CaCO}_3$  and  $\text{KH}(\text{CO})_2$  or  $(\text{HOCO})_2$ , *e. g.*, of 20 parts by wt. of  $\text{Na}_2\text{CO}_3$ , 20 parts of  $\text{K}_2\text{CO}_3$ , 10 parts of  $\text{CaCO}_3$  and 7 parts of  $\text{KH}(\text{CO})_2$  or 4 parts of  $(\text{HOCO})_2$ . A filler which will not injure the clothes, such as  $\text{NaCl}$ , may be added.

**Plastic compositions.** F. RINGER. Brit. 159,169, Sept. 27, 1920. Addition to 151,641 (*C. A.* 15, 581). The compn. described in the principle patent, consisting mainly of magnesite and  $\text{MgCl}_2$  together with org. fibers and powdered soapstone, is improved by the addition of formalin and a weak soln. of glue during the mixing of the ingredients. Articles molded from this compn. are immersed in a concd. soln. of  $\text{NH}_4$  salt and then rubbed with a K soap.

**Sheet material coated with acetaldehyde condensation product.** E. E. NOVOTNY. U. S. 1,370,666, Mar. 8. A sheet material adapted for making printing plates or phonograph records is formed of cardboard, paper, plywood or other suitable base coated with a condensation product formed by the reaction of a phenol or creosol on acetaldehyde. The condensation product may be formed of  $\text{PhOH}$  100 and acetaldehyde 75 parts, employing  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  as a catalyst.  $\text{HCl}$  is eliminated by steam distn. and  $\text{H}_2\text{SO}_4$ , if used, is subsequently neutralized. The dehydrated condensation product may be used as a powder or dissolved in alc., acetone or  $\text{C}_6\text{H}_6$  and applied as a varnish. It is more thermoplastic than phenol- $\text{CH}_2\text{O}$  condensation products and may be molded cold in a manner similar to shellac compns. The base is first lightly impregnated with the compn. and then given a substantial coating suitable for retaining impressions.

**Impregnating fiber with oxychloride cement.** D. C. COLLIER. U. S. 1,372,118, Mar. 22. Fibrous material such as wood pulp or asbestos is placed upon a foraminous support together with  $\text{MgO}$  and the mixt. is then treated with a soln. of  $\text{MgCl}_2$  to form an oxychloride binder on the fiber and produce a material adapted for manuf. of sheets or boards.

**Molded articles comprizing tung oil.** L. H. BAEKELAND, U. S. 1,372,114, Mar. 22. Tung oil is heated to a relatively high temp. (preferably about 205–210°) without solidification, mixed with a filler such as silex, asbestos and wood flour and the mixt. is molded and baked, and then given an external coating of insol. material, *e. g.*, asphalt or phenolic condensation product. This method is adapted for the manuf. of elec. insulators.

**Imitation metal foil.** CHEMISCHE FABRIK VON HEYDEN AKT.-GES. Brit. 157,126, Jan. 8, 1921. Imitation metal foil, more particularly for the "tips" of cigarettes, is prepd. from a soln. of a cellulose ester with the addition of metal powder, by spreading the soln. in an exceedingly thin layer by means of a feed-roller or a spraying device, over a well polished and slightly heated steel roller, and after drying, continuously stripping the film or foil from the roller; the film is cut into bands of the desired length and these may be strengthened by attaching them to silk paper. A soln. of acetylcellulose in acetone, to which is added bronze powder, is a suitable initial material.

**Silver plating.** Y. A. P. SCHWARTZ. Brit. 158,460, Feb. 6, 1920. Metals are coated with Ag by applying a powder moistened with  $\text{H}_2\text{O}$ . The powder contains a phosphate of Ag and an org. acid together with a polishing material. *E. g.*, it may be made up of 10 parts by wt. of  $\text{Ag}_3\text{PO}_4$ , 8 of tartaric acid, and 82 of kieselguhr. Or solns.

containing equiv. quantities of  $\text{AgNO}_3$  and  $\text{Na}_3\text{PO}_4$  may be mixed with the other components and the mixt. dried and reduced to powder.

**Preventing condensation on windows.** J. H. T. ROBERTS. *Brit.* 157,484, June 6, 1919. Condensation of  $\text{H}_2\text{O}$  vapor on windows, goggles, screens, etc., and walls formed of or covered with tiles or vitreous material is prevented by applying a coating of a substance such as that known as a "gell" or gelatinous substance deposited from a warm aq. soln. and remaining insol. at ordinary temps. Albumins, gelatins, glues, algal jellies, agar, and casein are mentioned as suitable substances. Glycerol may be applied to prevent cracking of the film and dyes may be used to produce a tinted light. *Cf. C. A.* 15, 1383.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**The recovery of the art of making glass pearls.** O. SCHWARZBACH. *Diamant* 43, 82(1921).—Historical. J. B. PATCH

**Imitation pearls by means of variegated layers.** OTTO W. PARKHRT. *Diamant* 43, 159-60(1921).—Historical. J. B. PATCH

**The firing of ceramic ware with petroleum.** J. THOMAS-CADILHAT. *Ceramique* 23, 145-149(1920); *Tonind. Ztg.*, 45, 36(1921).—In the stoneware potteries of Mexico petroleum has been used successfully since 1919. The advantages of petroleum over coal are: (1) a more uniform heat is obtained; (2) the kilns are not chilled by removing ashes; (3) less labor is required; (4) upkeep is lower; (5) there are no ashes dust or slag; (6) there is a better control of temp., fuel consumption and kiln atm.; one pottery reaches cones 9-10 in 24 hrs. in a kiln having a capacity of 90 cu. m. and cone 1 in 22 hrs. H. G. S.

**Lime as a source of trouble in clay.** ZIMMERMANN. *Tonind. Ztg.* 44, 993(1920).—When  $\text{CaO}$  is present in clay its tendency to slake may be overcome by a long soaking heat during firing, which causes the  $\text{CaO}$  to combine with the clay, thus dead-burning the  $\text{CaO}$ . H. G. SCHURECHT

**Quartzites and silica bricks.** F. WERNICKE. *Stahl u. Eisen* 40, 432-7(1920).—For the manuf. of silica bricks in Germany, rocks of 3 different geological formations are employed, viz., felsquartzites—marine deposits belonging to the Devonian period—which have a dense structure of closely interlocked crystals, the individual quartz grains being relatively large, with sharply defined edges and a characteristic wavy extinction of color; carboniferous sandstones, consisting of medium-sized quartz crystals, some having sharply defined edges and closely interlocked, while in others the edges are corroded and the crystals are sepd. by a small quantity of cement-like material; and glacial or "amorphous" quartzites—fresh-water deposits of Tertiary origin belonging to the period of lignite formation—consisting of very small grains of quartz with rounded edges distributed uniformly through an amorphous ground-mass of siliceous gel or "basaltic" cement. All these quartzites are very rich in silica; their refractoriness corresponds to that of cone 36 (1790°). In the manuf. of silica bricks it is not necessary to effect a complete conversion of quartz into tridymite provided the max. expansion is attained. With glacial quartzites this is reached by one firing at 1450° without excessively prolonged heating, but silica rocks from the coal measures require 2 or 3 firings before they attain their max. expansion, and felsquartzites continue to expand after several prolonged firings. By examn. under the microscope with a magnification of only 45 diams. using polarized light, useful quartzites can be distinguished from the useless ones, as the former contain minute crystals in a glassy ground-mass, while the latter consist almost wholly of larger crystals or sharply defined fragments of such crys-

tals. For the arches of elec. and other metallurgical furnaces, silica bricks should be made of glacial or Tertiary quartzites. For glass-melting furnaces, where the temp. is not so high, silica bricks made from coal measure quartzites are satisfactory, and may be recommended on account of their greater purity and the lesser risk of spoiling the glass. Coal measure quartzites may also be used for silica bricks employed in regenerators, coke ovens, etc. Mixts. of Tertiary and coal measure quartzites are also used. Coarse cryst. quartzites are only suitable for low-grade silica bricks used in annealing furnaces, etc.

J. S. C. I.

**The effect of calcination of flints on earthenware bodies.** A. HEATH AND A. LEXEN. *Pottery Gas*, 46, 816-8(1921).—The sp. gr. of flint may vary from 2.6 to 2.2 according to calcination temp. To compare the effect of high- vs low-fired flint in an earthenware body, plates were made for trials. Plates containing the high-fired flint shrank 4% while those with low-fired flint shrank 5%. The porosity with high-fired flint was 20.09% while that with low-fired flint was 17.83%. Plates made with low-fired flint crazed first. In a discussion Grimwade stated that when flint is fired to cone 3a it has a bluish cast. Mellor explained that this was due to the S present, which forms ultramarine blue with the flint.

H. G. SCHURCHT

**German naval specifications for firebrick used in boiler settings.** ANON. *Mitt. Brennkraftsch. Ges.* 2, 51-56; 8, 57-9; *Tonind. Ztg.* 44, 1097-8(1920).—Heavy dense brick should be used in contact with the coal bed, medium heavy in contact with flames only and light elsewhere. No. 1 brick should not deform under cone 34. No. 2 brick, cone 31-33 and no. 3 brick, cones 26-30. Brick, in contact with the fuel bed should contain at least 38%  $Al_2O_3$ . For a mortar a mixt. of grog and fireclay is used which vitrifies at cone 10 and has a deformation point of cone 34.

H. G. SCHURCHT

**Crystal glazes for stove tile.** ANON. *Tonind. Ztg.* 45, 12(1921).—The compn. of some of the glazes experimented with are given below:

	1	2	3	4	5
$Pb_2O_3$	91	118	141	182	185
ZnO	40	32	24	...	6.5
$CaCO_3$	10	...	...	7	5
$SiO_2$	60	48	55	60	75
$H_2BO_3$	25	...	...	...	...
Kaolin	..	15	...	...	15
Feldspar	..	44	44	55	22
Rutile	..	32	16	24	12.5
Molybdic acid	..	...	...	5.5	4

No. 1 was fritted and  $Fe_2O_3$ , NiO and CuO were added as coloring oxides. The resultant crystals were small and not well formed. No. 2 gave a mat with considerable crystal formation. No. 3 also gave a mat. Expts. were conducted in which  $TiO_2$  and ZnO were replaced by the acids of W, Mo and V. Star-shaped crystals were obtained. Glazes with W, ZnO and  $TiO_2$  showed many small opaque crystals. V produced mat glazes. Glazes with more than 0.15  $Al_2O_3$  were mat with some crystals. Glazes without  $Al_2O_3$  produced the best crystals. CaO is necessary since the CaO-free glazes showed only weak crystn. The best coloring oxides are CoO and CuO.  $UO_2$  was satisfactory in some cases. Glazes containing  $Fe_2O_3$ ,  $Mn_2O_3$  and NiO were limited to small crystals only. Glazes 4 and 5 are used in the unfritted condition and were fired in 20-24 hrs. on a body consisting of 10 stoneware clay, 20 kaolin, 35 quartz, 8 feldspar and 7% chalk.

H. G. SCHURCHT

**Electric furnace refractories.** R. D. PIKE. *Chem. Met. Eng.* 23, 1148(1920); cf. C. A. 15, 582.—Polemic. Amorphous magnesite raised to a temp. of 1550°, in the presence of 5-6%  $Fe_2O_3$  is transformed to cryst. periclase, which is dense, hard, and sin-

tered and known as dead-burned magnesite. Microscopic examn. demonstrates that  $\text{Fe}_2\text{O}_3$  added to the rock under proper conditions is equivalent in its action to the Fe occurring naturally in the rock. W. H. BOYNTON

**Air cracks in refractories.** FISCHER. *Tonind. Ztg.* 44, 1270(1920).—Air cracks are those caused by rapid heating and cooling while shrinkage cracks develop during firing. When a piece of the ware is broken it usually cracks along the air cracks.

H. G. SCHURECHT

**Electric heat raises enameling output.** J. W. CARPENTER. *Elec. World* 77, 878-5 (1921).—C. describes an installation of a metallic resistor furnace for baking vitreous enamel ware. High quality of the product is due to const. and readily controlled heat. The initial and operating costs are higher, but 30-50% more charges per hr. may be made than with coal, oil or gas with 25% greater wt. for each charge. Maintenance expenses and cost of shutdowns are negligible. 900 lbs. enamel ware are baked per hr. with consumption of 130 kw.-hr. The furnace is of the box type. A ribbon of Ni-Cr alloy wire is arranged in lattice-like construction on the sides, top and bottom. Temp. does not exceed 982°. W. H. BOYNTON

#### Refractories for bottom-connected electric furnaces (BROOKS) 4.

**Special Reports on the Mineral Resources of Great Britain. XIV. Refractory Materials: Fireclays.** Memoirs of the Geological Survey. London: H. M. Stationery Office. 243 pp. 8s.

**Finishing glass.** L. SHOWERS. U. S. 1,373,532, Apr. 5. Smooth relatively opaque glass is polished with a polishing powder of about the same color as the glass with polishing devices maintained at such a temp. as to cause "burning" of the glass. A "soft" finish is thus formed on Carrara or other glass.

**Apparatus for annealing glass or similar heat-treatments.** D. E. GRAY. U. S. 1,372,420, Mar. 22.

**Translucent antislipping tile.** M. F. BEESCHER. U. S. 1,374,136, Apr. 5. A safety tread material is formed of a translucent substance such as glass into which are fused particles of hard, wear-resisting, antislipping material such as cryst.  $\text{Al}_2\text{O}_3$  granules.

**Refractory brick.** C. W. BERRY. U. S. 1,373,854, Apr. 5. A refractory material is formed by mixing raw magnesite and bauxite, mixing with  $\text{H}_2\text{O}$  and firing at a temp. sufficiently high to drive off moisture and gas, regrinding the calcined product and shaping it with  $\text{H}_2\text{O}$  and then firing the molded material to produce a hard coherent article.

**Refractory material.** E. D. FROHMAN. U. S. 1,372,016, Mar. 22. A refractory material is formed of finely divided dry fireclay mixed with siliceous material such as ganister or asbestos and with dextrin or a sol. gum as a binder. (Cf. C. A. 14, 814.)

## 20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

**The effect of mineral oils on cement.** A. GUTTMANN. *Tonind. Ztg.* 44, 1116(1920).—Three samples of cement showed decreased strength owing to immersion in oil.

	Air		Petroleum oil		Coal-tar oil	
	28 das.	6 mos.	28 das.	6 mos.	28 das.	6 mos.
C	210	192	168	185	160	158
K	287	272	242	252	216	249
B	262	288	193	238	191	189

Cements into which the oil had penetrated the furthest were weakened the most. Adding a material which would make the cement impervious to liquids would, therefore, increase resistance to mineral oils.

H. G. SCHURCHT

**Effects of "Cal" as an accelerator of the hardening of Portland cement mixtures.** ROY N. YOUNG, Bur. of Standards, *Tech. Paper No. 174*, 1-24(1920).—The need for a practical and efficient material for accelerating the hardening of Portland cement mixts. is emphasized. A summary of the tests on Cal carried out by Y. is: Cal is a material obtained by pulverizing the dried or undried product resulting from a mixt. of either quicklime or hydrated lime,  $\text{CaCl}_2$  and water. It is a dry white powder which may be handled in much the same way as hydrated lime, and with the same general keeping qualities. It is more much convenient to handle and use in making concrete than  $\text{CaCl}_2$ , either fused or in concd. soln. Upon exposure to the air Cal gradually takes up  $\text{CO}_2$  and becomes somewhat damp. However, tests indicate that long exposure does not affect its action as an accelerator of the hardening of Portland cement mixts. The setting of normal Portland cement mixts. may be hastened by Cal to an extent which is very desirable in concrete construction requiring a finished surface. The finishing operation may proceed with much less delay after the concrete has been placed, which should result in cutting down overtime labor. This hastening of the set is not objectionable in any type of construction providing the concrete is placed soon after it is gaged with water. It is believed that Cal increases the workability of Portland cement mixts. However, no attempt was made to measure the extent of this effect, because of lack of a satisfactory test. Unsound cements may be greatly benefited or made sound by an addition of Cal. This effect was produced in neat pats subjected to the steam test and in mortar test pieces stored in air. Limited tests indicate that quick-setting cements, either fresh or having become quick-setting on aging, may be made normal by the addition of Cal as used in cement mixts. There was no indication that the amt. of efflorescence appearing on the surface of cement mixts. exposed to the weather is increased by the use of Cal. The series of tests on the effect of Cal on steel reinforcing bars which were embedded in a thin layer of Cal cement mortar and exposed to the weather for 8 months without showing any sign of corrosion, while favorable, is too limited to give assurance that corrosion will not occur under these conditions. Caution should, therefore, be exercised in the use of Cal in concrete containing steel reinforcement when the concrete is to be freely exposed to the weather or excessive dampness. It is believed that no bad effect will be produced in ordinary building construction. Undried Cal mixed with Portland cement causes greater deterioration in the quality of the cement during storage than that which ordinarily takes place. Therefore, Cal should be added to the concrete materials during the mixing operation, preferably before the water is added. All Portland cement mixts. treated with Cal attained greater strength at the 2-day and 7-day periods than the corresponding untreated mixts. The percentage increase in the strength of mortar at the 2-day period obtained by an addition of 5% Cal to cement ranged from 40 to 140. The strength of the treated mortar after 2 days was equal to the strength of the untreated mortar after 3½ to 8 days. These calcns. are made from the results of tests in which the test pieces were stored in water, damp sand, or damp closet. Treated mortars stored in the lab. air attained at 2 days strength greater than that of the untreated mortars at 28 days. This was due to the rapid drying out of the small test pieces and the comparatively slow rate of gain in strength after the 2-day period. However, this indicates that Cal is especially advantageous in cement mixts. which are necessarily subjected to any drying out action. The increase in strength produced by 5% Cal in concrete mixts. at the 2-day period ranged from 52 to 135 %, and the strength of the treated concrete at the 2-day period was equal to that of the untreated at from 3 to 4½ days. On an av. this represents a saving of approx. one-half the time in operations



which are dependent upon the strength of the concrete at early periods. The effect of the air storage in the concrete tests was lessened in degree, owing to the high relative humidity which existed throughout the storage period. It should be remembered that the increase in strength resulting from an addition of 5% Cal does not represent the max. which may be obtained except in very rich mixes. As much as 15% Cal was used in mortar tests, giving an increase of 220% at the 2-day period. The general effect of Cal on Portland cement mixts. is the same as might be expected from the use of equiv. amts. of hydrated lime and  $\text{CaCl}_2$ . The 3-year tests by the Bureau of Standards, on concrete gaged with a soln. of  $\text{CaCl}_2$  are sufficient grounds for believing that the addition of Cal will not injuriously affect the ultimate strength and integrity of Portland cement concrete.

J. C. WIRR

**The effect of "Cal" on corrosion.** J. C. WIRR. *Concrete (Mill Section)* 18, 154(1921); cf. preceding abst.—Preliminary tests indicate that Cal does not cause rust formation and that it acts as an inhibitive agent against the corrosive effects of other substances.

J. C. W.

**Effect of tannic acid on the strength of concrete.** DUFF A. ABRAMS. *Proc. Am. Soc. Testing Materials* 20, I, 309-39(1920).—Mixes varied from 1-5 to 1-2 with aggregates ranging in size from fine sand to a graded aggregate up to  $\frac{1}{4}$ -in. Tannic acid was applied as a surface coating in quantities 0.05, 0.10, 0.20 and 0.40% of the weight of each of the aggregates; compression tests were made at ages 7 days, 28 days, 3 months, 1 and 2 years, on 3 by 6 inch cylinders; 2000 tests were made. The principal conclusions are: (1) The results of these tests are typical of the effect produced by org. impurities in concrete. (2) The strength of concrete was reduced for all percentages of tannic acid, for all mixes and ages covered by these tests. (3) Lean mixes. are more affected by tannic acid than rich ones. (4) The mixts. from the finer aggregates are less affected by tannic acid than those from the coarser aggregates. (5) The reduction in strength is a function of the concn. of tannic acid in the mixing water. An equation is given which represents this relation for the 28-day tests. (6) The strength falls off rapidly for small percentages of tannic acid and less rapidly as higher percentages are reached. (7) The 7- and 28-day strengths are reduced to a greater extent by tannic acid than at ages of 1 and 2 years. (8) Some of the 1-5 mixes in which the higher percentages of tannic acid and the finer sands were used (2-3% soln.) disintegrated before the time of test. The 1-7 mixes (3-5% soln.) were destroyed in removing the molds.

J. C. WIRR

**Plaster of Paris brick.** ANON. *Tonind. Ztg.* 44, 1259(1920).—Bricks are made with ashes, sawdust, etc. using plaster of Paris as a binder. Plaster 1, ashes 3 and  $\text{H}_2\text{O}$  1.5 parts make strong brick. The crushing strength is 30 kg./sq. cm. In order to retard the setting sufficiently to allow molding, about  $\frac{1}{4}$  the vol. of  $\text{CaO}$  is added.

H. G. SCHURECHT

**A mortar material of anhydrite.** H. E. SACHSE. *Tonind. Ztg.* 44, 1017-8(1920).—Hartner found that by grinding anhydrite extremely fine and mixing it with  $\text{H}_2\text{O}$  it sets to form a hard cement especially if the mixt. is alk. This action is facilitated by adding 1-3%  $\text{CaO}$  or Portland cement. This cement is different from Estrich plaster or plaster of Paris. Sample A of anhydrite cement was ground until 10% residue remained on a 4900-mesh sieve (177 meshes per linear inch); B was ground twice as long; and C five times as long. Tensile strength in kg./sq. cm., when mixed with Portland cement was:

	24 hrs.	48 hrs.	3 das.	7 das.	28 das.
A	10.0	13.0	14.0	19.0	30.0
B	18.0	20.5	21.5	25.5	35.5
C	22.0	24.0	25.0	34.0	29.5

H. G. SCHURECHT

The strengths of high-magnesia, hydraulic and common limes. ANON. *Tonind. Ztg.* 45, 2-3(1921).—Mortars were prepared of 1 part lime and 3 parts sand and tested for tensile strength after 28 das.

	In air.	In water.
High-MgO lime	3.4	1.2 kg. sq. cm.
Hydraulic lime	3.7	2.8 "
Common lime	2.5	...

H. G. SCHURECHT

Plaster molds for roofing tile. ANON. *Tonind. Ztg.* 45, 57-8(1921).—Instructions for mixing are given.

H. G. SCHURECHT

Operations of lime kilns with fuel oil. BERTHOLD BLOCK. *Deut. Zuckerind.* 46, 64(1921).—A description of such a kiln, of American make, is given, and its operation explained. Illustrated.

F. W. ZERBAN

Processes and equipment used in wood preservation. E. S. PARK AND J. M. WEBER. *Mech. Eng.* 43, 98-9(1921).—A brief résumé of the pressure treatments used in timber preservation, with reference to the "full-cell" and the "empty-cell" processes. In the former, the object is to fill the intercellular spaces of the wood as completely as possible with the preservative (coal-tar creosote or  $ZnCl_2$ ); in the latter the object is to obtain as deep a penetration as possible with the minimum use of preservative. P. and W. give a brief description of a typical timber-treating plant (with plans showing layout and equipment used) that has a capacity for treating 400,000 to 700,000 cross ties per annum.

L. E. WISS

Problems involved in the impregnation of telegraph poles. FRIEDRICH MOLL. *Z. angew. Chem.* 34, Aufsatzteil, 81-4(1921).—An illustrated descriptive article outlining clearly the problems faced by the wood-preservation industry, with special reference to European practice. Observations were made in England and the Continent on about 200,000 pine poles treated with  $ZnCl_2$ , 15 million poles treated with  $CuSO_4$ , 3 million poles treated with  $HgCl_2$  (Kyan process), and 4 million poles treated with coal-tar creosote. According to M. the "life" of the average telegraph pole is as follows: untreated, 5 yrs.; treated with  $CuSO_4$  (Boucherie process) using 6-10 kg.  $CuSO_4$  per cu. meter, 14.5 yrs.; treated with  $ZnCl_2$  (10 kg. per cu. meter) 12.1 yr.; treated with creosote oil (pressure treatment) 30 yrs.; treated with creosote (Rüping process) 18 yrs.; treated with  $HgCl_2$  (0.9 kg. per cu. meter) 16.5 hrs.; treated with mixt. of  $HgCl_2$  and NaF (1 kg. each per cu. meter) 18.5 yrs.

LOUIS E. WISS

Commercial advantages of impregnated poles. R. NOWOTNY. *Elektrotech. Z.* 42, 150-1(1921).—N. cites a number of examples as to costs of impregnated vs. unimpregnated poles, showing a large margin in favor of the impregnated.

C. G. F.

TWISLVETREES, W. NOBLE: *A Treatise on Reinforced concrete*. New York: Isaac Pitman and Sons. 264 pp. \$7.50. For review see *Mech. Eng.* 43, 359(1921).

Cements. E. WALLIN. *Brit.* 157,971, Jan. 10, 1921. A cement, particularly applicable for jointless floor coverings, comprises MgO and Mg nitrate or salts, such as  $Ca(NO_3)_2$  and  $MgSO_4$ , which will interact to produce Mg nitrate. The materials may be mixed in the dry state and moistened when required for use.

Cement. H. D. BAYLOR. *Brit.* 153,390, Nov. 8, 1919. See U. S. 1,323,952 (C. A. 14, 330).

Slowly setting cement. F. FERRARI. U. S. 1,372,015, Mar. 22. A slowly setting calcareous cement free from the binary Ca compds. of Al or Fe usually present is prepd. by converting into slag a raw mixt. of the ordinary type used for Portland cement, in which the proportion between the oxides  $Fe_2O_3$  and  $Al_2O_3$  is between 1 and 1.563.

**Asphalt paving mixture.** H. P. WILLS. U. S. 1,372,467, Mar. 22. A mixt. suitable for use in roads and other structures is formed of asphalt mixed with a large proportion of earthy filler and with an Al salt such as  $Al_2(SO_4)_3$ , which serves to harden the material.

**Bituminous compositions.** M. TALBOT-CROSBIE. Brit. 158,674, Nov. 7, 1919. A cement for road-making, roofing, etc., consists of approx. 55% of purified chalk such as whiting mixed with 45% of bitumen, etc., heated to about 150°. A small quantity of linseed or like oil may be added. The cement may be mixed with sand before use, suitable proportions being 23.5% cement and 76.5% sand.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Powdered coal as fuel for central station.** F. MUENZINGER. *Elektrotech. Z.* 42, 97-103(1921).—A detailed illus. review. C. G. F.

**An inventory of the (German) fuels, with respect to the new processes of coal utilization.** H. STRACHE. Vienna. *Brennstoff Chem.* 2, 88-9(1921); cf. *C. A.* 15, 158.—S. believes that his tube app. for investigating the coking properties of coals (*C. A.* 6, 286; 10, 3150; 14, 3774) possesses advantages over those described by Graefe, and Fischer and Schrader (*C. A.* 14, 3149). W. B. V.

**Swedish motor fuel.** H. WALLIN. *Svensk Pappers Tid.* 24, 69-71(1921).—Sweden used about 44,000,000 kg. gasoline in 1920. Sulfite plants now built can on full time produce about 20,000,000 kg. alc. If all plants of 6000 tons capacity ran alc. departments another 20,000,000 kg. might be produced. Other sources are shale oil, of which there is unlimited amt. but which it is not economical to ext. unless markets can be found for the by-products, and motor oil from the Rinman process of recovering soda at sulfate cellulose plants. W. SAGERBLUM

**Recovery of coal particles from slags.** LUDWIG MEISSNER. *Elektrochem. Z.* 27, 41-5(1920).—The high cost of fuel in Germany has stimulated the promotion of com. methods of recovering coal particles from slags. The Krupp magnetic separator is described: From 3% to 5% of the coal or coke originally fed to the furnaces is recovered by this separator. In handling 5 tons of slag per 16-hr. day, a recovery of 4800 tons of coke per annum is possible, equivalent to 20% of the slag or 4% of the coke originally fed to the furnaces, at a cost (estimated) of 39.3 marks per ton of coke. Detailed figures are tabulated. C. G. F.

**Recovery of coke and coal from ashes.** ULRICH. *Deut. Zuckerind.* 46, 94-5, 109-12(1921).—The clinker obtained from coal and coke is magnetic. Separators consist of a fixed system of electromagnets with one or more semicylindrical, highly concd. magnetic fields, within which a thin-walled drum is rotated. The ashes are conveyed to the drum, where the non-magnetic coal and coke particles drop off by gravity, whereas the magnetic slag is held until the drum during the rotation reaches the non-magnetic part of the field, when it also drops off. The separators handle from 0.25 to 2 tons per hr. The power consumption is 0.6 to 2.4 kw. hr. Ashes of widely varying compn. have been handled, as shown by the figures obtained in a number of practical tests. The slag after being freed from coal and coke, forms an excellent material for the manuf. of artificial stone.

**Firing with coal dust.** H. P. LYSAKER. *Papir-Journalen* 7, 121-2(1920).—This article refers briefly to the use of coal dust under boilers in America. W. S.

**Steam blower firing.** WILHELM OTTO. *Glasind.* 32, 25-6(1921); 5 figs.—The steam blower used with a special grate designed by Otto Thost of Zwilsau, Saxony, trebles the fuel capacity of a boiler, making possible the use of inferior fuel. J. B. PATCH

**Drying fuel by means of smoke gases.** O. NORDSTROM. *Svensk Pappers Tid.* 24, 71-72(1921).—A drying tower of about 120 cu. m. capacity consists of 2 circular Fe

towers surrounded by a brick casing. The sawdust is fed into the space between the Fe towers. The dry sawdust is pressed out at the bottom by the wt. of the drying mass and is conveyed to the boiler room. The smoke gases pass through a metal chamber which removes sparks and solid particles and then through suitable holes in the inner tower through the sawdust and thence to the chimney. Thermostats regulate the temp. of the gases and protect against spontaneous ignition. The moisture content can be reduced from 60% to about 30%. The fuel saved during the year more than paid for the installation of the dryer.

W. SEGERBLOM

**Cooling the fire in a producer with fine gases.** HERMANN KOSCHMEIDER. *Brennstoff Chem.* 2, 86-8(1921); cf. *C. A.* 15, 938, 587.—“In the case of fuels which need little heat to effect gasification, such as the dry, high-carbon coals which yield much coke cooling with steam, without preheating the air, is advantageous; on the other hand in the case of fuels which require much heat for gasification, carbon-poor lignite, peat, etc., giving little coke, a better result is obtained by cooling with flue gases, preheating, under some conditions, the air required for combustion.”

W. B. V.

**Chlorination of natural gas.** G. W. JONES, V. C. ALLISON AND M. H. MEIGHAN. *Bur. of Mines, Tech. Paper No. 255*, 44 pp.(1921).—The reaction between  $\text{Cl}_2$  and  $\text{CH}_4$  begins, in the dark, at about  $250^\circ$ ; above this temp. the reaction velocity increases until a temp. is reached at which explosions result and C deposits. Temps. between  $300$  and  $400^\circ$  are the most suitable. The chlorinated products, which are condensed by passing through  $\text{H}_2\text{O}$ , will not condense after the removal of  $\text{HCl}$ , unless their vapor pressures are above their satn. pressures at the temp. of the  $\text{H}_2\text{O}$ . When excess gas is passed through the app. considerable amts. of the products will pass through without condensing unless low temps. and high pressures are used. The residual gases may contain  $\text{CCl}_4$  equal to 12%,  $\text{CHCl}_3$  equal to 21% and  $\text{CH}_2\text{Cl}_2$  equal to 47% before condensation will take place. From the sp. heats and heats of formation at  $0^\circ$  of the chlorinated products of  $\text{CH}_4$ , the heats of formation at  $400^\circ$  at const. pressure are found to be for  $\text{MeCl}$ , 29,220;  $\text{CH}_2\text{Cl}_2$ , 33,500;  $\text{CHCl}_3$ , 44,910;  $\text{CCl}_4$ , 65,940 and for  $\text{HCl}$  22,540 cal. The calcd. heats of reaction at  $400^\circ$  are: for the formation of  $\text{MeCl}$ , 32,800; for  $\text{CH}_2\text{Cl}_2$ , 59,680; for  $\text{CHCl}_3$ , 93,630 and for  $\text{CCl}_4$ , 137,200 cal. By dividing the heats of reaction by the sum of the heat capacities of the reacting substances the max. temps. obtainable in the four reactions are found to be,  $1,820^\circ$ ,  $2,290^\circ$ ,  $2,760^\circ$  and  $3,270^\circ$ . The gas used in the expts. contained 89.5%  $\text{CH}_4$ , 10.1%  $\text{C}_2\text{H}_6$  and 0.4%  $\text{N}_2$ . The app. was so constructed that the  $\text{Cl}_2$  and natural gas, the rate of flow of each being regulated by flow meters, were mixed and fed into an electrically heated glass tube, the temp. of which was measured by a thermocouple. The gases issuing from the reaction tube were passed through a triple-walled condenser for cooling, then through a trap,  $\text{NaOH}$  scrubber, and two ice baths. Most of the  $\text{C}_2\text{Cl}_6$  sepd. out in the cooler and the  $\text{CCl}_4$  settled to the bottom of the scrubber and ice baths. After each run the distillates from the scrubbers and ice baths were mixed, treated with  $\text{NaOH}$ , then  $\text{CaCl}_2$  and distd. In this app. the flow of the natural gas was 1 l. per hr. For higher rates of flow the app. was modified so that the gases were introduced into the reaction tube through a mixer made like an injector, and the hot gases issuing from the tube passed through two low-pressure scrubbers of special design, each containing  $\text{H}_2\text{O}$ , then through a trap in an ice-salt bath held at about  $-15^\circ$  into drying towers containing soda-lime and  $\text{CaCl}_2$  and finally out through a 3-way stop-cock, from which samples of residual gases were taken for  $\text{MeCl}$  detns.  $\text{CCl}_4$  and  $\text{C}_2\text{Cl}_6$  condensed in the scrubbers, while the dichlorides condensed in the ice-salt bath. A large number of catalyzers, principally coal, coke, charcoal and coke impregnated with various metals, were used with a view to finding the ones best adapted for the formation of  $\text{CHCl}_3$ ,  $\text{CH}_2\text{Cl}_2$  and  $\text{CCl}_4$ . The catalyzers most suitable for  $\text{CHCl}_3$  formation were the cokes impregnated with Pt, Ni, M, Zn, Cd, Fe and Sn, while the activated charcoals and the batchite, although producing a high efficiency for total

chlorinated products, gave a low yield of  $\text{CHCl}_3$ . The coke-Pt catalyst gave 50%  $\text{CHCl}_3$  and 34% of other chlorinated products, while coke-Ni catalyst gave 49%  $\text{CHCl}_3$  and 46% of other chlorinated products. For  $\text{CCl}_4$  formation gas-mask charcoals (80%  $\text{CCl}_4$  and 18% of other chlorinated products), steamed coal and batchite showed the highest efficiency. The highest yields of  $\text{MeCl}$  (31%) were obtained from cokes impregnated with such metals as Ni, Sn and Pb, with a ratio of 2 vols. of  $\text{Cl}_2$  to 1 of gas. Activated charcoals and similar catalysts were not found suitable for  $\text{MeCl}$  formation. A small amt. of moisture in the gas aided in the chlorination. The  $\text{CH}_3\text{Cl}$  was analyzed by dissolving in glacial  $\text{AcOH}$  which had previously been satd. with natural gas. The paper contains many historical data and references and a table showing the location of gas wells in the U. S. which contain large amts. of  $\text{CH}_4$ . G. W. STRATTON

The recovery of ethylene and ethyl alcohol from the gases of dry distillation. BRUNO WÄSSER. *Brennstoff Chem.* 2, 90-1(1921).—A review. W. B. V.

Some novel processes for the removal of paraffin from lignite tar and for its distillation. F. SEIDENSCHNUR. Berlin-Grünwald. *Brennstoff Chem.* 2, 49-51, 73-8, 81-6 (1921).—The published methods for purifying crude paraffin include treatment with  $\text{EtOH}$ , liquid  $\text{SO}_2$ ,  $\text{C}_2\text{H}_5\text{N}$  or  $\text{Me}_2\text{CO}$ . The use of a 2.8 mixt. of  $\text{C}_2\text{H}_6$  with  $\text{EtOH}$  is described; the recovery is somewhat better than with  $\text{Me}_2\text{CO}$ , the m. p. of the paraffin somewhat higher, and the cold test of the recovered oil almost identical. Data are given for a lignite paraffin oil thus treated; the products were 19% light oil, cold-test below  $-18^\circ$ , 53% machine oil, cold-test  $-4.5^\circ$ , paraffin-containing oil 4%, paraffin I, 12%, m. p.  $54.5^\circ$  and paraffin II, 12%, m. p.  $44.5^\circ$ . Similar data are given for the products from a Thuringian tar and a Rositz tar, and semi-com. app. for crystn. and filtration are described. W. B. V.

Coke in 1918. C. E. LESHNER AND F. G. TRYON. U. S. Geol. Survey, *Mineral Resources of U. S., 1918*, Part II, 1439-1528 (Preprint No. 37, published April 22, 1921). E. H.

Sulfite liquor as a motor fuel (HUBENDICK) 23. Illuminating gas poisoning (MÜLLER) 11H. Coal in San Juan County, New Mexico (BAUER, REISIDE) 8. Character of coal in the Thomas bed near Harrison, W. Va. (CAMPBELL) 8. Lubricants from tar oils, etc. (Brit. Pat. 158,252) 13. Cleaning gases (U. S. pat. 1,372,710) 4.

SIBLEY, ROBERT AND DELANY, C. H.: Elements of Fuel-oil and Steam Engineering. 2nd Ed. Revized and enlarged. New York: McGraw-Hill Book Co. 466 pp. For review see *Mech. Eng.* 43, 358(1921).

STARKER, RICH. F.: Gaswirtschaft. Ein Beitrag zur Prüfung der Wirtschaftlichkeit, der Nebenproduktengewinnung des Gasbetriebs für Stahlwerke und Kraftwerke und der Gasfernversorgung. Berlin: Jul. Springer. M. 34. For review see *Z. angew. Chem.* 34, Aufsatzteil, 152(1921).

Fuel. A. M. DUCHAM. Brit. 159,089, Jan. 24, 1920. A fuel consisting of a mixt. of coal dust or other carbonaceous solid and oil, tar, or other liquid fuel, is made by grinding the coal, etc., in presence of the oil, etc.

Artificial fuel. C. W. G. CLEWLOW. Brit. 158,688, Nov. 10, 1919. Pulverized coke breeze, anthracite dust, or the like is mixed with a liquid binding material, such as a mixt. of molten hard pitch and liquid dehydrated tar, with or without subsidiary materials, such as  $\text{CaO}$  and resin; the mixing is effected by stirring the anthracite dust or pulverized coke breeze in a hopper while the liquid binding material is sprayed thereon by a nozzle pursuing a path which follows the path of the stirring action. The mixt. is cooked or heated in an app. into which steam and hot gases are introduced. A suitable construction is specified.

**Fuel.** L. W. BATES. Brit. 158,546, Jan. 14, 1921. The stable composite of coal dust, etc., in a liquid hydrocarbon usually known as "colloidal fuel" is sepd. into a paste and into a liquid contg. only a small proportion of suspended particles by centrifuging, by reducing the viscosity of the liquid and allowing the suspended particles to settle out, or by filtration through cheese-cloth, linen, or filter paper, or by any combination of these processes. The necessary reduction in viscosity may be effected by heating, or by adding benzene, alc., or other suitable liquid. The liquid may be used mixed or not with alc. or gasoline, as a fuel for internal-combustion engines, and the % of mol. and colloidal coal may be increased by stabilizing further coal dust in it and, if required, again sepg. the larger particles. The paste, thinned or not with liquid hydrocarbon, may be used as a fuel, or it may be briqueted, or be mixed with hardening substances to form a road compd. Cf. C. A. 14, 3313.

**Motor spirit.** FARBWERKE VORM. MEISTER, LUCIUS AND BRUNING. Brit. 157,222, Jan. 8, 1921. Hexahydrobenzene, alone or with a little alc., benzene, or other hydrocarbon, is used as a motor spirit.

**Distilling alcohol for use in motor fuels.** E. W. STEVENS. U. S. 1,372,465, Mar. 22. Commercial alc. contg.  $H_2O$  is prepd. for use in making composite motor fuels by redistg. the alc. with hydrocarbon oil such as  $C_6H_6$ , gasoline or kerosene and fuel oil and collecting a fraction relatively free from  $H_2O$  and consisting mainly of alc.

**Fuel for producing smoke to protect plants from frost.** C. A. J. J. VAN DER LINDEN. Brit. 157,448, Jan. 10, 1921. Plants are protected from frost by forming a cloud of heavy smoke by burning a fuel made by mixing or impregnating absorbent or porous materials with products of the distn. of coal and petroleum. Peat-litter and peat-dust are given as examples of the absorbent material and the following as examples of the impregnating substance, viz. naphthalene,  $\alpha$ -methylnaphthalene,  $\beta$ -methylnaphthalene, biphenyl, acenaphthene, pentamethylbenzene, hexamethylbenzene, and hydrogenated naphthalenes, and anthracene. Blowing-app., etc., may be used for distributing the smoke. The fuel may be pressed into briquets.

**Operating vertical cross-connected gas retorts.** W. D. WILCOX. U. S. 1,372,731, Mar. 29. One of two generators each beneath a corresponding cross-connected vertical gas retort is blasted and the blast gases are directed through a closable outlet into heating flues adjacent to the retorts while a partial vacuum is concurrently created at a closable outlet in the lower portion of the second generator sufficient to draw the gases and vapors distg. off in the retorts through the previously heated material in the second generator and through the outlet. The operation is then reversed. The maximum pressure within the app. is at a point in the lower portion of the retort above the generator in blast.

**Gas.** L. W. BATES. U. S. 1,373,704, Apr. 5. See Can. 206,182 (C. A. 15, 594).

**Gas producer.** J. C. MILLER AND A. ISLES. U. S. 1,373,443, Apr. 5. The body of the producer is rotatable.

**Gas-scrubber and tar-extractor.** J. WELLS. U. S. 1,373,280, Mar. 29.

**Tar extraction.** E. BARRETT ET FILS ET C<sup>IE</sup>. Brit. 158,915, Nov. 4, 1918. Addition to 120,558 (C. A. 13, 660). Tar is removed from the products while in a state of vapor through cresol, instead of treatment of the condensed products as described in the principal patent. The vapors are first bubbled through tar and then, at a temp. of 115–130°, are bubbled through cresol. The tar is sepd. from the cresol by distn.

**Distilling tar.** BARRETT CO. Brit. 158,852, Apr. 1, 1920. In distg. coal tar, water-gas tar, oil-gas tar, blast-furnace tar, lignite tar, and other tars, a current of gas which is insol. in and exerts no chem. action on the tar, e. g.,  $N$ ,  $CO_2$ ,  $CO$ , or mixts. of these gases, is passed through the tar in a still and after passage through a condenser, pump and a heater, is again passed into the still. Air, from which the  $O$  has been absorbed by passage through tar, may be re-circulated. A higher yield of oil, a smaller amt. of free  $C$ , and pitches of higher m. p. are obtained. Cf. C. A. 15, 1208.

**Distilling coal tar, etc.** C. ANDER-HALDEN. Brit. 158,875, Jan. 24, 1921. Coal tar, pitch, crude oil, etc., are distd. in the presence of steam. The tar, etc., preheated in a condenser, passes by a pipe into a column divided by gratings, lattices, etc., and surmounting a still, heated preferably by gaseous fuel, the supply of which may be regulated by a thermostat. Steam, which may be superheated, is supplied by a pipe and residues are removed by a pipe. The vapors pass from the top of the column to a vessel in which the heavy fractions condense. A small heat exchanger may be interposed in the path of the vapors, and steam may be injected into the vessel to regulate the compn. of the fraction obtained. The vapors then pass through the condenser, the vessel and a reflux condenser. The lightest fractions are condensed in a condenser. A second pipe connects the condenser and column to allow passage of steam and light vapor generated in the preliminary heating of the tar, etc.

**Recovering benzene from wash-oils.** F. RASCHIG. Brit. 157,793, Jan. 10, 1921. In recovering benzene from the heavy oils used for washing coke-oven gas, the oils are distd. *in vacuo*, at a temp. of about 150° obtained by steam coils and at a pressure of about 0.1 of an atm.

**Dissolving, separating and extracting agent for the solid constituents of tar oil.** TETRALIN-GES. M. B. H. Ger. 301,651, Apr. 23, 1916. Hydrogenated naphthalenes may be employed, by themselves or in combination with other substances, for the purpose of keeping in soln., by their mere presence in the tar oils, the naphthalene, considerable amts. of which, usually mixed with anthracenes, sep. out from the tar oils when stored for some length of time, forming residual mixts. which it is difficult to work up from the technical standpoint. Thereafter the cleaning of the containers, which would otherwise be necessary at regular intervals, may be dispensed with, while, on the other hand, it becomes possible to recover the anthracene from the tar oil by the addition of hydronaphthalene, which can then be obtained, free from naphthalenes, in the form of a crystalline mass, which may easily be pressed off. Finally, the loss of the naphthalene, useful for heating and preserving purposes, is obviated.

**Freeing tar oils from phenols.** HERMANN BORCK. Ger. 322,423, Oct. 25, 1919. When crude tar oils or the like are freed of phenols or cresols by treatment with soda liquor and other bases, H<sub>2</sub>O always forms, whereby phenols are again produced, so that a complete hindering of phenols never takes place. When, however, in place of soda liquor, metallic Na or a similar metal is employed, the reaction takes place quant. and no re-formation of phenols takes place. The tar oils may be recovered, free from phenols, by being pressed off, distd. off, etc.

**Coal tar products.** W. ANDERSON and J. MEIKLE. Brit. 158,337, Oct. 31, 1919. Coal tar is treated for the production of a resinous solid containing hydrocarbons mixed, it is believed, with oxidized hydrocarbons; other products are gas, C, and a liquid free from naphthalene. The tar is injected into a tubular heater by means of steam in excess of that required to effect complete vaporization at the temp. employed, preferably 450-600°. C is sepd. from the vaporous products, and the resinous solid and the liquid are obtained by fractional condensation. A suitable construction is specified.

**Carbonization of brown coal and peat.** K. JACOBS. Brit. 157,794, Jan. 10, 1921. Partially dried brown coal or peat is freed from H<sub>2</sub>O and CO<sub>2</sub> by heating to about 250° until tarry distillates are obtained and an exothermic reaction begins which with a further application of heat up to between 290 and 350° serves to distil off the low-temp. tar. The resulting product is a long-flame fuel. Internal heating with superheated steam up to 10% of the wt. of the material treated may be employed to assure uniform heating, accelerate the removal of distillates and increase the yield of NH<sub>3</sub>, HOAc, and MeOH.

**Carbonization of brown coal and peat.** K. JACOBS. Brit. 157,795, Jan. 10, 1921. A semi-coke adapted to form a substitute for gas coal is obtained from brown coal or

peat by heating the pre-dried material in a vessel with the outlet open until low-temp. tar begins to be distd., whereupon the outlet is closed so that the material is subjected to further heating, which may be of an exothermic nature, under an increased pressure resulting from the closing of the outlet.

**Carbonization.** G. POLYSIUS. (Firm of.) Brit. 157,318, Jan. 10, 1921. In a low-temp. carbonization process an externally heated retort is also internally heated by a stream of gas taken from the retort and preheated by being passed through the hot coke leaving the retort. A suitable construction is specified.

**Carbonizing.** J. R. GARROW. Brit. 158,002, July 31, 1918. The sensible heat of producer gas is utilized in the dry distn. of carbonaceous material at temps. ranging from 450 to 1000° in an internally heated rotary retort. One or more producers are arranged in close proximity to the retorts, and the charge is treated for 5-6 hrs.; by-product recovery producers may be used. Cf. 13,830, 1899, 18,279, 1900 and 1676, 1914 (C. A. 9, 1992).

**Distilling coal, etc.** K. JACOBS. Brit. 157,976, Jan. 11, 1921. Methane or a mixt. of methane and H are obtained in the distn. of peat, wood, or brown coal by collecting the gases given off after the liberation of CO<sub>2</sub> has subsided, this occurring between about 300° and 500°.

**Carbonizing; gas-producers.** W. P. PERRY. Brit. 158,394, Nov. 10, 1919. In the continuous distn. of carbonaceous material by passing therethrough streams of hot gas, the volatile products are collected in a chamber provided with one or more outlets for gases, vapors, and liquid distillates. A suitable construction is specified.

**Coking.** TRENT PROCESS CORPORATION. Brit. 159,142, Feb. 4, 1921. Commi-nuted carbonaceous materials are heated to distil off the volatile products and are projected against a collecting surface on which the viscos particles cohere to form a coke-like mass. A suitable construction is specified.

**Briquetting coke.** C. E. TURNBULL. Brit. 157,380, Jan. 8, 1921. To the pitch used for briquetting coke are added thin liquid coal tar or the oils obtained from tar distn. or both. Brown coal or lignite tar or the tar obtained from H<sub>2</sub>O gas, oil or rich gas and the primary coal tars or the primary tars from brown coal and pitch tar, or the oils from the distn. products of these tars may be added, provided they become very liquid when heated. The binder completely displaces air and H<sub>2</sub>O from the pores and it cokes during burning, causing the briquet to harden and retain its shape.

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Some relations between the characteristics of steam-distilled petroleum residuals. B. A. ANDERTON. *Proc. Am. Soc. Test. Materials* 20, pt. 2, 298-313 (1921).—The 2 most important points developed are (1) the significance of the fixed C test in relation to the progress of the distn., and (2) the development of the float test as a measure of viscosity and susceptibility to temp. changes. Comparisons are made between California, Mexican, and in some cases Texas residuals. Fig. 1: Typical tests of consistency with progress of distn. Float test and viscosity plotted against % of residues give similar curves. Fig. 2: Penetration of California and Mexican asphalts showing greater sp. gr. of Mexican products. Fig. 3: M. ps. plotted against sp. grs. showing greater sp. gr. of the Mexican products. Fig. 4: Fixed C plotted against viscosity. Fig. 5: Penetration plotted against fixed C. Fig. 6: % residue plotted against fixed C. A relation which apparently is independent of the type of oil used may show the value of the fixed C test. The following relation seems to hold:  $RC_R = 100 C_{100}$ , where  $C_R$  is the % fixed C of a steam-distd. petroleum residual which is  $R$  % of the original having a fixed C of  $C_{100}$ %. Fig. 7: Fixed C plotted against % insol. in 86 B6. naphtha,



showing the tendency of the fixed C and the bitumen insol. in naphtha to increase together. Fig. 8: % insol. in 86 B $\acute{e}$ . naphtha plotted against float test illustrates that at some point during distn. reactions begin which increase in importance as temp. rises, resulting in actual formation of asphaltic bodies. Fig. 10: (viscosity plotted against float test) and Fig. 11: (penetration plotted against float test) illustrate the importance of the float test, which gives a measure of the viscosity combined with susceptibility. Discussion by F. P. Smith and Prevost Hubbard. F. W. PADGETT

**Determination of chlorides in petroleum.** RALPH R. MATTHEWS. *J. Ind. Eng. Chem.* 13, 325-8 (1921).—The method is applicable to petroleum in which the salt water is more or less emulsified with the oil. One vol. of oil is dild. with  $\frac{1}{4}$  vol. of acetone, which tends to break the emulsion and collect the salt water. It is then dild. to 4 vols. with water and shaken well; the water-acetone layer which seps. contains all the Cl, which is detd. by titration of an aliquot, and calcd. to g. NaCl per liter of oil. Results check well and are accurate. R. R. MATTHEWS

**Problems of the oil shale industry.** R. D. GEORGE. *Chem. Age (N. Y.)* 28, 453-7 (1920).—The conclusions are that the fundamental problems of the shale oil industry are solved; retorting presents fewer difficulties than does the refining; many of the refining problems, however, will vanish if retorting is done properly. American inventors are "inventing" app. and processes abandoned 20 or 30 years ago, and often are not profiting by Scottish experience. Problems of retorting are discussed with reference to: (1) Yield of products, (2) quality of crude oil, (3) yield of  $\text{NH}_3$ , (4) com. efficiency. 650-750 lbs. of steam to ton of shale give best results. The advantages of steam in retorting are: (1) Evolution of products at lower temp., (2) 2 or 3 times the yield of  $(\text{NH}_4)_2\text{SO}_4$ , (3) higher % of light oils in the crude, (4) lower % unsatd. hydrocarbons, (5) the prevention of coking and clogging, (6) more rapid removal of oil vapors from retort. Expts. in retorting under pressure have proved unsatisfactory. The av. N content of Colo. shales is 0.6%, which equals 56 lbs.  $(\text{NH}_4)_2\text{SO}_4$  per ton, of which only about  $\frac{1}{3}$  is available by com. retorting. *Lubricating oils* from shale oil retain viscosity at much higher temps. than do oils of similar d. and flash point made from petroleum. A well made crude shale oil should yield from 16 to 22% motor gasoline and 40% kerosene distillate; these products contain roughly 60-70% olefins. *Shale oil gasoline* should be a superior product, if properly refined. F. W. PADGETT

**Economies in oil burning.** R. SIBLEY AND C. H. DELANY. *Elec. World* 75, 1483-4 (1920).—The results of burning oil fuel in various types of boilers and burners are recorded. E. J. C.

**Firing with oil in stationary steam boilers.** H. P. LYSAKER. *Papir-Journalen* 8, 69-72 (1920).—L. gives suggestions to those intending to install oil firing systems covering (1) chem. compn. of fuel oil, (2) transportation and storage, (3) oil-burners, (4) conducting the oil and air to the burners, (5) combustion chamber, (6) comparison of oil with coal and other fuels as firing material and (7) the requirements for changing to oil firing. W. SEGERBLOM

**Asphaltic compounds in the generator tar obtained from lignite.** J. MOURIK. *Chem. Listy* 15, 29-34 (1921).—These compds., insol. in benzene and sol. in alc., were found to be the source of resinous phenols during the destructive distn. of the tar. Fr. Fischer and V. Schneider (*C. A.* 14, 2074) isolated these substances but did not investigate their chem. nature. The tar, purified by pptg. the asphaltic compds. with benzene, gave practically the same quantity of cresol and its homologs on distn. as the impure tar. This indicated that no cresol or its homologs were formed from the asphaltic material during the distn. JOHN M. KRNO

**Carbonization of wood by means of the exhaust gases from gas engines.** LOUIS TISSIER. *Chimie & industrie* 5, 136-42 (1921).—T. gives a brief description of his process for the utilization of hot waste exhaust gases from gasoline engines, oil engines,

etc. The heat of the exhaust gases is used in effecting wood distn., and the process is especially recommended where wood is plentiful and coal is scarce. The temp. of exhaust gases after leaving the cylinder of gasoline engine or Diesel engine often approximates 400-480°. More than 40% of the heat furnished the engine is thus lost. According to T. this corresponds to heat of combustion of 180 g. C per H.-P. hour. By passing the hot gases (whose composition is 78% N, 14% CO<sub>2</sub>, and 8% O) through wood piled in a specially constructed furnace (Fours Tissier), a high grade charcoal and pyroigneous acid may be readily obtained. The charcoal (compr. 63.3% C, 20.7% volatile matter, 15.8% ash, 0.17% organic acids, 0% tar) has a heat of combustion of 7340 cal., and is obtained in 33% yield. The pyroigneous acid contains approximately 6.2% AcOH and 1.5% MeOH. T. gives a brief description of his furnace, and discusses operation and yields as compared with those of other processes. L. E. WISE

Effect of mineral oil on cement (GUTTMANN) 20. Anesthetic and convulsant effects of gasoline vapors (HAGGARD) 11H. Alkali soaps from mineral oils (Ger. pat. 327,048) 27.

DELAISI, FRANCIS: *Le Pétrole*. Paris: Librairie Payot et cie. 158 pp. 5 fr. For review see *Rev. gén. sci.* 32, 187(1921).

KROGHEL, M. DE: *Traité de la conversion et de l'amélioration des bois*. Paris: J.-B. Baillière et fils. 360 pp. 10 fr., bound 15 fr. For review see *Chem. Trade J.* 68, 519(1921).

Distilling petroleum oils. C. KROLL. U. S. 1,373,251, Mar. 29. Vapors from a petroleum still are passed into a heat-insulated dephlegmating drum mounted above the still and filled with crushed rock or similar obstructing material and the higher boiling constituents of the initial distillate are thus sepd. from the vapors while those of lower b. p. pass on to a condenser.

Distilling petroleum; pitch; fuel. H. WADR. Brit. 158,918, July 21, 1919. Pitch for use as fuel is obtained by distg. crude petroleum or its residues by injecting superheated steam or inert gases into the oil, etc., in a fire-heated still, the process being continued until a pitch of high m. p. is obtained, which is equiv. in proportion to the proportion of coke and gas produced by distg. to dryness by fire alone. The distn. may be effected in a continuous plant comprizing a number of stills through which the oil passes in series. The product may be used as fuel either in the granular form mixed with coal, in the powdered form, or as a liquid fuel, open pans being used instead of grate bars. Cf. 10,892, 1908 (*C. A.* 3, 2502) and 10,959, 1908.

Distilling shale in molten metal. L. B. ARD. U. S. 1,373,698-9, Apr. 5. Shale to be distd. is forced down into a mass of molten metal, e. g. Pb, in a retort and then is permitted to float up through the molten metal while its progress is retarded by a helical vane, which keeps it immersed a sufficient time for adequate heating and distn.

Recovery of oil from shale and other bituminous rocks. ZELLER and GRELIN. Ger. 321,870, Aug. 23, 1918. The process is carried out in rotary retorts heated from the outside, under admission of steam or other gases free from O. The rock is slowly distd. in such a manner that during the entire process the temp. of the highly superheated steam or gas introduced will be about 50° higher than the temp. of the rock to be distd. By this process the yield in shale oil is increased 100% or more, while the bitumen, which escapes from the shale in the form of gas and which it has heretofore not been possible to condense, is recovered in the form of a high-grade lubricating oil.

Vertical retort with superposed hearths for distilling oil from shale and sands. JONES. U. S. 1,373,890, Apr. 5.

Cracking hydrocarbon oils. D. T. DAY. U. S. 1,373,391, Mar. 29. Hydrocarbon oils to be cracked are formed into a solu. with petroleum residues of higher cracking

points and cracking is carried out at a temp. below the cracking point of the residues added to the oil. These solvent residues are sepd. from material of lower b. p. by distn. and are reused as a carrier of additional oil for continuing the cracking process.

Apparatus for cracking hydrocarbon oils. J. W. COAST, JR. U. S. 1,372,937, Mar.

29. The pat. relates especially to scrapers mounted within a horizontal cylindrical still.

Freeing catalysts from carbon in cracking hydrocarbon oils. E. W. STREVEN. U. S. 1,374,119, Apr. 5. Metals such as Ni, Fe, Co, Pt, Pd, Mo or W which are employed as catalysts in cracking oils or in other reactions in which C tends to deposit on the catalyst are kept free from injurious sooty deposits by showering them with sparks developed by a rapidly oscillating a. c. of high potential.

Obtaining gasoline from crude oil. P. DANCKWARDT. U. S. 1,373,653, Apr. 5. In producing light hydrocarbon oils from heavier oils, the latter are heated with charcoal,  $AlCl_3$  or other chloride and a metallic catalyst to facilitate the production of vapors of the lighter hydrocarbons, which are separately condensed. U. S. 1,373,654 relates to a similar process, in which a mixt. of C, Ni and Ni chloride is ignited, treated with air and steam to maintain combustion, after which the oil to be treated is brought into contact with the material and allowed to distil. The vapors formed are passed through another body of oil mixed with a similar catalyst and the light hydrocarbon vapors produced are condensed.

Emulsifying mineral oils. E. M. JOHANSEN. U. S. 1,373,661, Apr. 5. About 1.5-8% of  $H_2O$ -sol. sulfonates derived from acid treatment of mineral oil are used to effect the emulsification of mineral oils with  $H_2O$ , e. g., in prepg. emulsions adapted for use as insecticides, lubricants or for other purposes.

Centrifugal separation of oil emulsions. P. T. SHARPLES. U. S. 1,373,773, Apr. 5. The pat. relates to regulation of the operation of a centrifugal machine to effect segregation of oil and  $H_2O$  from mixts. and emulsions.

Resin-like substances from wood tar. J. D. RIEDEL, AKT.-GES. Ger. 320,620, July 11, 1918. Halogens are made to act on wood tar in gaseous or liquid state or the nascent state by generation methods not new in themselves, with or without addition of catalysts, with heating and vigorous stirring, until the tar upon cooling forms a solid brittle lustrous resin-like mass. As contact substance  $AlCl_3$  is preferably used. The halogen, e. g. Cl, may either be introduced directly from bottles, or it is generated in the tar. As soon as the mass thickens and sets, the heating is discontinued; after cooling, the liquid is poured off, the mass washed a few times with warm  $H_2O$ , and finally the residue of  $H_2O$  remaining in the mass is removed by fusing. The resultant blackish brown resinous mass is as brittle as shellac, and when used as varnish produces a quickly drying lustrous coating.

## 23—CELLULOSE AND PAPER

A. D. LITTLE

Chemistry of cellulose. I. Constitution of cellulose. HAROLD HIBBERT. *J. Ind. Eng. Chem.* 13, 256-60, 334-42(1921).—A theoretical paper. H. reviews the work of previous investigators, and discusses at some length the constitutional formulas proposed by Cross and Bevan, Green, Tollens, Vignon, Barthelmy and Hess, and shows wherein all of these are in disagreement with some of the more recent exptl. data. H.'s

formula for cellulose, which contains the unit:  $\begin{array}{c} \text{CH-CH(CH}_2\text{OH)-O-} \\ | \\ \text{O} \\ | \\ \text{CHOH-CHOH-CH-} \end{array}$  is apparently in harmony with the present day developments in cellulose chemistry, especially with the data on hydrolysis of methylated cellulose and on acetylation of cellulose.

LOUIS E. WISE

A new cellulose industry in Argentine. ANON. *Papir-Journalen* 9, 15(1921).—A factory near Parana River is described as producing 3 tons of cellulose per day from a grass *Paja brava*. W. SEGERBLOM

The cellulose industry in South Africa. E. F. HEYERDAHL. *Papir-Journalen* 8, 145-7(1920).—Describes briefly the establishment by Norwegian capital of the first factory in South Africa for making paper from papyrus (*Cyperus papyrus*). Raw material is plentiful and labor cost low. W. SEGERBLOM

Estimation of cellulose in wood. BJARNE JOHNSEN. *J. Ind. Eng. Chem.* 13, 358-60 (1921).—Criticism of the recent work by Dore (*C. A.* 14, 1038) and Mahood (*C. A.* 14, 3153). No new exptl. data are given. S. A. MAHOOD. *Ibid* 360-1.—Reply to Johnsen's criticisms. WALTER H. DORE. *Ibid* 362-3.—Reply to Johnsen. L. E. WISE

Chemical specifications in the paper and cellulose industries. HALSER. *Papir-Journalen* 8, 97-99(1920).—Preliminary observations looking towards the establishment of a cellulose research institute for Norway. W. SEGERBLOM

Preparatory work on forest investigations regarding determination of resin, cellulose and specific gravity. H. E. WAHLBERG. *Svensk Pappers Tid.* 24, 108-12(1921).—The paper-pulp office has undertaken an elaborate investigation of different woods with regard to their suitability for paper making, namely the detn. of (1) relation between green or dry wt. and the vol., also hark vol., (2) cellulose content, (3) max. length of fiber, (4) fat and resin content, (5) water-sol. sugar, (6) pentoses and (7) lignin content. Items 2 to 5 will be investigated by the paper-pulp office, which will also photograph the samples and consider the different qualities, characteristics, variations, amt. of annual growth and the effect of such extraneous influences as height above ground, effect of different soils and climate, imperfections and decay. W. has begun investigations on topics listed in the above title and found that many years will be required to obtain the desired information, since the variations between different parts of the same tree are sometimes greater than the variations between one kind of wood and other kinds. It is necessary to exam. separately for each wood the spring rings and the fall rings, root, trunk and branch wood. Drying was best accomplished over  $P_2O_5$  in vacuum at room temp. for 2-3 days. The vol. was obtained by replacement of Hg in a special app. Extn. of resin is best done in two steps, first with benzene for 10 hrs., then with alc. for 6 hrs. both at digesting temp. For the detn. of cellulose the Cross and Bevan method and the Mueller method were discarded in favor of a modified combination of the Mueller method and the Klasson method. W. SEGERBLOM

Report of the advisory committee of the Society of Paper and Cellulose Engineers. F. GRUWIN, et al. *Svensk Pappers Tid.* 24, 27-30(1921).—The committee recommends the establishment of several technical schools for the paper and cellulose industries and presents curricula for 5 different 4-year courses of study. W. SEGERBLOM

The fuel question in the cellulose industries. R. W. STREHLENERT. *Svensk Pappers Tid.* 23, 459-60(1920).—The yield of 200 kg. of dry fuel per ton of pulp as previously announced is corrected. By using both the pptn. method and the evapn. method the yield is raised to 600-680 kg. per ton of pulp. W. SEGERBLOM

The cellulose content of spruce wood. P. KLASON. *Svensk Pappers Tidning* 24, 7(1921).—K. had previously announced this compn. of spruce wood: cellulose 53%, other carbohydrates 13%, lignin 29% and other substances 5%. From elaborate investigations which he intends to continue he now announces the compn. of spruce wood as: cellulose free from pentosans 53%, hemicellulose 15%, lignin 30% and other substances 2%. Four days' digesting does not give clean cellulose. Most digestions ran 10 to 20 days. W. SEGERBLOM

The effect of bleaching on the amount of  $\alpha$ -cellulose in sulfite cellulose. E. WAHLBERG. *Svensk Pappers Tidning* 24, 92(1921).—Unbleached sulfite cellulose consists usually of 83-85%  $\alpha$ -cellulose, 7-9%  $\beta$ -cellulose and 6-9%  $\gamma$ -cellulose. Digesting

with 2% NaOH soln. 5 hrs. under 5 atm. pressure yields a cellulose consisting of about 94%  $\alpha$ -cellulose, 3%  $\beta$ -cellulose and 3%  $\gamma$ -cellulose. Eight detns. on 2 samples of unbleached sulfite pulp showed that AcOH increases the % of  $\beta$ -cellulose, that varying the temp. does not appreciably change the ratio of the different celluloses and that very careful bleaching is necessary for a high % of  $\alpha$ -cellulose.\* W. SÖGERBLOM

**Digesting cellulose under high pressure and low temperature.** ANON. *Papir-Journalen* 7, 184-5(1919).—Instead of digesting wood with alk. liquor under 6-10 atms. and at 150-180° or with sulfite under 3-6 atms. and at 115-140°, it is suggested to put the wood and liquor in the digester, and increase the pressure by pumping in liquor, air or gases to as high as 50 atms. The digestion then takes place at a low temp. and gives a stronger cellulose. Thorough impregnation of the wood by the liquor may be assisted by vacuum. W. SÖGERBLOM

**Some observations on the digestion of wood cellulose, particularly sulfite cellulose.** C. G. SCHWABE. *Svensk Pappers Tidning* 24, 129-31(1921).—S. points out the necessity of testing both wood and liquor during digestion because the sugars are apt to form condensation products or to combine with the wood itself. Samples are best taken when the pulp is soft, or sample digestion may be done in a 30-l. vessel. During the first stage of the digestion Ca enters the wood, the ash of which rises from 0.48% to 1.8%. The Ca content of the liquor decreases correspondingly. The incrustations seem to be hexosans. The releasing of sugar affects the softening of the pulp. Pulp softens more quickly when thoroughly soaked and digested in steam and weak H<sub>2</sub>SO<sub>4</sub> than when digested in liquor. Green wood having 56% of water yields by indirect digestion 52% of long-fiber soft cellulose. Direct digestion of the same wood gives a smaller yield. If the resin is extd. by water soln. of cheap chemicals the wood does not need to be dried before digesting. Warm moist air swells the wood better than steam or water; moistening with waste liquor hastens the digestion because of presence of org. acid salts. W. SÖGERBLOM

**The testing of sulfite pulps.** R. G. MILHAM. *Paper Industry* 2, 1837-40(1921).—A description of the usual tests for moisture, color, dirt and strength of sulfite pulps. M. has obtained better results in the ball mill strength test by use of a hand mold than by a suction mold. Results, however, are comparable only when obtained by the same operator. H. H. HARRISON

**Analysis of pulp for moisture in England.** A. FORSELLER. *Svensk Pappers Tidning* 23, 460-62(1920).—F. was sent to England to investigate the cause of so many claims regarding moisture content of pulp imported from Sweden and Finland. He found that though the contracts called for the "wedge system" of sampling described by Sindall and Bacon, in practice the sampling was far from correct. The pulp had not been protected from rain during transit and after arrival was stored some indoors and some outdoors. F. recommends protection of pulp from water during storage and transportation, even drying out of moisture, consultation between the technicians of various plants, standardization of sampling methods, taking of samples by a neutral person and frequent testing of balances and wts. W. SÖGERBLOM

**Analysis of pulp for moisture in England.** G. A. *Svensk Pappers Tidning* 23, 489(1920).—A. points out that pressing all bales to the same thickness eliminated most of the claims from one plant. Cf. preceding abstract. W. SÖGERBLOM

**Analysis of mineral matter in paper.** JAMES SCOTT. *Paper-Maker and Brit. Paper Trade J.* 61, 523-4(1921).—A method is given of analysis for the ash from paper differing little from American practice. H. H. HARRISON

**Observations from a trip to the United States and Canada in the fall of 1920.** A. BYWELL. *Svensk Pappers Tidning* 24, 87-91(1921).—All the stages from logs to paper as done in the United States and Canada are described and compared with similar

processes in Sweden. Even labor conditions, wages and housing of employees are considered in detail.

W. SÖGERBLOM

Save the calories; take account of how many such calories are lost. COMMUNICATION FROM THE PAPER PULP OFFICE. *Svensk Pappers Tid.* 24, 30-1(1921).—In order to avoid waste of heat it is suggested that for each part of a wood-pulp plant simultaneous and accurate measurements be made of all energy and material required, the amts. used and the amts. lost. For instance, in the boiler room these measurements should be taken: amt. of fuel, amt. and temp. of water, vol. and temp. of air used in burning, vol., temp. and pressure of steam produced, vol. and temp. of smoke gases and other losses. The calories produced and the calories consumed should agree. Similar measurements should be made for the turbine house, the digesters, drying room, evapn. of liquor, bleachery, alcohol and other by-products department, piping systems, etc. The waste heat from one department should be transferred to another department with as little loss as possible. Data from different plants should be collected and compared confidentially.

W. SÖGERBLOM

Electric drive for paper machines with rapid regulation. W. STIEL. *Svensk Pappers Tid.* 24, 48-53(1921).—In order to ensure a speed for paper machinery which shall be const., free from variations due to outside influences and capable of considerable range, S. suggests electric drive and shows by two diagrams the wiring and connections for the electric regulators (shown in 5 cuts). The range of speed is shown by 13 recording charts.

W. SÖGERBLOM

Saving steam in drying machines. K. L. THUNHOLM. *Svensk Pappers Tid.* 24, 132-4(1921).—More than half of the fuel required in the paper and cellulose industries is used for drying. Curves show the relative amts. of total heat used and heat calcd. on amt. of condensed water for different drying rolls. The increase in heat used in winter over summer is much larger than the heat lost through the walls and roof. Detn. of the vol. of air necessary to carry off the water evapd. led to the installation of a device at the Oerebro Paper factory for using the warm moist air, that saves 25% of steam in winter and 15-20% the year round. Improvements promise a saving of 35%.

W. SÖGERBLOM

Palmyra palm leaves. F. HEIM, J. MAHER AND L. MATROD. *Bull. de l'Agence générale des colonies* 13, 801(1920); *Bull. Imp. Inst.* 18, 447-8(1920).—The leaf blade of *Berassus flabellifer* yielded 5.34% ash, 52.2% cellulose, 41.6% lignone and small quantities of wax-like substances. On digestion with NaOH under pressure, it yielded 28.3% of a brown colored pulp which was difficult to bleach. The leaf stalk yielded 1.75% ash, 0.87% fats and waxes, 53.6% cellulose and 41.6% lignone. Digestion with NaOH yielded 29% of a pulp which could be satisfactorily used for paper making.

R. L. SIBLEY

Analysis of raw sulfite acid. R. SIEBER. *Svensk Pappers Tid.* 23, 418-21(1920). Almost without exception too high results (5-15%) were obtained for free acid when alk. titrating methods were used. Titration errors which are small in themselves are large when the ratio of free acid to the 3% of total acid is considered, and the presence of CO<sub>2</sub> may affect greatly the accuracy of the results. The CO<sub>2</sub> may be present in the distd. water, in the NaOH soln. or in the sulfite acid itself. Investigations comparing the older and newer methods for analysis of raw sulfite acid showed that of the newer methods that of Sanders and of the old methods that of Hoehn, provided Me orange or better p-nitrophenol is used instead of phenolphthalein as an indicator, are both reliable.

W. SÖGERBLOM

Evaporation of waste sulfite liquor. H. BERGSTROM. *Papir-Journalen* 8, 34(1920).—The compression method when using electric energy instead of coal for evapn. of waste sulfite liquor not only saves fuel but also construction and operation costs; it also yields AcOH and undecompd. org. compds.

W. SÖGERBLOM

Sulfite liquor as motor fuel. HUBENICK. *Papir-Journalen* 8, 109(1920).—The greatest drawback to using sulfite liquor is the difficulty of starting the engine when cold, but this can be overcome by changes in the vaporizing system. W. SÖDERBLOM

Ethyl alcohol and coal from sulfite waste liquor. N. E. CLEMENTSON. *Pulp Paper Mag. Can.* 19, 317-22(1921).—By the use of the new methods of the Ethyl Co. 85% Et. alc. can be obtained at a cost of 21.4 cents per gallon and the residue can be evapd. to give a fuel equal to the best coal for \$5.13 per ton. The Mechanicville plant of the West Virginia Pulp and Paper Co. was erected to produce sulfite spirit by this process.  
H. H. HARRISON

Swedish motor fuel (sulfite alcohol) (WALLIN) 21. The chemistry of the moving picture industry (NAMIAS) 5. Silicate soap for the paper and textile industries (Ger. pat. 320,829) 27.

HÄUSER, EMIL: *Lehrbuch der Cellulosechemie*. Berlin: Gebrüder Borntraeger. 188 pp. M. 32, bound M. 39. For review see *Brennstoff-Chem.* 2, 128(1921).

Pulping cellulose, alkali-cellulose, etc. A. KAMPF. *Brit.* 157,982, Jan. 12, 1921. App. for converting cellulose, alkali-cellulose, etc., to a loose and fine flocculent mass comprizes a trough and beaters provided, resp., with teeth and grooves closely engaging one with the other and being arranged in such a manner that the material is subjected to a continuous cutting and pulverizing action as it is forced into and through the grooves; the number of cutting edges is increased by interposing grooves in the length of the channels.

Nitrocellulose solutions. E. M. FLAHERTY. *Brit.* 158,586, July 8, 1919. Pyroxilin is dissolved in a solvent consisting of butyl acetate and a homolog of benzene, or solvent naphtha to which butyl, ethyl, or other aliphatic alc. may be added. The soln. may be mixed with other pyroxilin solvents, oils, pigments, gums, resins, etc.

Nitrocellulose: artificial filaments, films, etc. FABRIQUE DE SOIE ARTIFICIELLE DE TURIZZ. *Brit.* 157,220, Jan. 8, 1921. For the manuf. of artificial silk, hair, or straw, and films, hands, etc. of nitrocellulose, a soln. of the latter is squirted directly into a bath of  $H_2SO_4$ ; the strength of the bath is varied according to the proportion of moisture in the soln. and may range between 30 and 75%, calcd. as monohydrate. The filaments, etc., are preferably squirted in an horizontal direction, and after passing through the bath, are wound on a bobbin, and either are allowed to stand until coagulation is complete or are washed with  $H_2SO_4$ , dil. alc., a soln. of salt, or  $H_2O$ . The process is applicable to nitrocellulose solns. prepd. with acetone, EtOAc, or mixts. of these with alc., in addition to the usual alc.-ether.

Colloiding cellulose esters. F. E. STÖCKELBACH. U. S. 1,370,853, Mar. 8. Nitrocellulose or other cellulose esters are colloided with phosphoric acid esters of benzyl alc. or substituted benzyl alcs. such as  $ClC_6H_4CH_2OH$ ,  $HOOC_6H_4CH_2OH$  or their homologs. A mixt. suitable for the manuf. of a celluloid-like product is formed of nitrocellulose 75,  $(PhCH_2)_3PO_4$  25% or nitrocellulose 75 and a mixt. of  $(PhCH_2)_3PO_4$  10 and camphor 15% together with volatile solvents such as acetone, EtOH,  $CHCl_3$ , or  $C_6H_6$ .

Iridescent finish on celluloid. A. H. ROSENTHAL. U. S. 1,372,088, Mar. 22. An iridescent or mother of pearl finish is imparted to articles formed of celluloid or other material having a smooth adhesive surface, by treating the surface of the article with a Bi compd., e. g., Bi chloride, and then applying a celluloid coating.

Coated paper. H. R. RAFSKY. U. S. 1,374,112, Apr. 5. Paper is coated with a pigment produced on  $Na_2CO_3$  by the action of slaked lime containing magnesia in an aq. medium, together with an adhesive.

Resinous composition suitable for coating paper. W. E. B. BAKER and H. WEAVER.

U. S. 1,373,044, Mar. 29. A compn. adapted for coating paper articles such as paper receptacles or caps for bottles or other containers is formed by heating together rosin 32 oz.,  $\text{NaHSO}_4$  0.375 oz. and terra alba 32 oz. The  $\text{NaHSO}_4$  serves as an oxidizing agent on the rosin to prevent substances of disagreeable odor or taste from existing in the product. For this purpose other compds. such as a hypochlorite or chlorate also may be employed. The terra alba is dehydrated before it is heated with the rosin.

**Paper felt.** A. L. CLAPP. U. S. 1,372,640, Mar. 22. Sheets of paper felt are formed of rag fiber mixed with sufficient finely divided sawdust to increase the caliper of the material and give it a smooth open porous surface and with sufficient chemical wood pulp to offset the decrease in strength due to the use of the sawdust. The sheet is of greater caliper and yardage and of equal or greater strength than one produced from an equal wt. of rag fiber alone.

**Adhesives from sulfite liquor.** E. POLLACSEZ. Brit. 157,907, Jan. 10, 1921. An adhesive compn. is made from waste sulfite cellulose lye by neutralizing the liquid with slaked lime, concg. the filtrate until a sample sets on cooling, and then adding a heavy mineral oil in such quantity that a further sample remains liquid on cooling. The resulting liquid is of use as a binder in the manuf. of briquets of coal and ore.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

The pressure limit of autoxidation considered as a particular case of the lower limit of explosion. II. W. P. JORISSEN. *Uitv. Leyden. Rec. trav. chim.* 39, 715-19 (1920).—J. has shown in a previous paper (*C. A.* 12, 2480) that the pressure limit of autoxidation may be considered as a particular case of lower limit of explosion. If in a mixt. of an inflammable gas and  $\text{O}_2$  (or air) the proportion of the 1st gas falls below a certain limit (or if the  $\text{O}_2$  content rises above a certain value) inflammation does not occur when a spark or flame is introduced. Similarly in a mixt. of P vapor and  $\text{O}_2$  (or air) the autoxidation stops when the  $\text{O}_2$  content rises above a certain limit (when the  $\text{O}_2$  pressure passes a certain value). The only difference is that in the last case the oxidizable vapor (or gas) does not require a flame or spark to promote reaction. J. and Ringer (*Chem. Weekbl.* 2, 275(1905)) also found that  $\text{H}_2\text{O}$  vapor influences the pressure limit of autoxidation of P as it does the explosion of mixts. of  $\text{CO} + \text{O}_2$ . Thus for P the limit pressure is 600 mm. at  $15^\circ$  in  $\text{H}_2\text{O}$ -sattd.  $\text{O}_2$ . It falls to 330 mm. at  $15^\circ$  with  $\text{O}_2$  dried with  $\text{P}_2\text{O}_5$ . The analogous action of  $\text{N}_2$  on phosphorescence of P and the explosion of  $\text{H}_2$  and  $\text{CH}_4$  was previously demonstrated. J. has now shown that  $\text{CO}_2$  has even a larger influence in this way than  $\text{N}_2$ . Other expts., cited from the literature, with  $\text{CO}$ ,  $\text{H}_2$  and  $\text{N}_2\text{O}$  on phosphorescence of P show the same effect. Ewan (*Z. physik. Chem.* 16, 340 (1895)) showed that  $\text{AcH}$  is not oxidized in the dark when the  $\text{O}_2$  pressure is above 530 mm. at  $20.6^\circ$ . J. has repeated the expts., mixing  $\text{CO}_2$  with  $\text{AcH}$ . The explosion limits for  $\text{AcH}$  were 5.7-13.5% by vol. When  $\text{O}_2$  was mixed with  $\text{CO}_2$  in the proportion present in air and used in place of air the  $\text{AcH}$  mixts. could not be exploded. When a mixt. 21%  $\text{O}_2$ , 60%  $\text{CO}_2$  and 19%  $\text{N}_2$  was used the explosion limits were 8.1-11.0%  $\text{AcH}$  by vol. The replacement of  $\text{N}_2$  with  $\text{CO}_2$  accordingly has a large influence.

E. J. WITZEMANN

**Origin and prevention of sugar-dust explosions.** GOTTHARDT LIEBETANZ. *Deut. Zuckerind.* 46, 19-20(1921).—Tests carried out in an exptl. chamber gave the following results: The danger of explosion increases with the fineness of the dust. Other conditions being equal, a small moisture content favors explosion. The lowest ignition temp. for sugar dust is around  $425^\circ$ . Not only an open flame, but hot bearings, etc., may cause explosions. The smallest amt. of sugar dust per  $\text{m}^3$  of air which may



lead to an explosion is 72 g. when the electric arc ignites the mixt., 370 g. for the electric spark, and 180 g. for a kerosene flame. Slight additions of  $\text{CH}_4$  greatly increase the danger of explosion. The following safety rules are advocated: Mixts. of air and inflammable gases must be avoided in rooms containing sugar dust. Revolving machine parts must be encased as is done in mines. All electric wiring must be done in special conduits, or in the form of cable. For purposes of illumination only incandescent lamps with safety cover, or double screened mine lamps must be used, but no arc lamps. The best method of preventing explosions is the installation of dust removers. (Cf. C. A. 15, 1402.)

F. W. ZERBAN

Origin and prevention of sugar dust explosions. P. BEYERSDORFER. *Deut. Zucker-ind.* 46, 38(1921).—The article by Liebetanz (cf. preceding abstract) gives only a part of the results obtained. The expts. are being continued, but nothing further has been published, because some of the points need further study before definite conclusions can be drawn.

F. W. ZERBAN

#### Fertilizers from perchlorate explosives (Ger. pat. 321,878) 15.

Explosives. H. RATHSBURG. Brit. 153,540, Dec. 3, 1920. Dinitrodinitrosobenzenes or their salts are used as or in explosive charges, detonators, fuses, primers, or percussion caps. The following processes of manuf. of these compds. are described: (1) from dinitroaniline; (2) from *o*-dinitrobenzene by nitration; (3) from trinitrodiazobenzeneimide by the splitting off of N on heating; (4) from picryl azide by heating in a dil. alc. soln., when at the same time the trinitrodiazobenzeneimide which is formed as an intermediate product is decomposed with the splitting off of N and the formation of 1, 2-dinitroso-4, 6-dinitrobenzene.

Explosives. ARTHUR WILHELM. Ger. 300,040, Mar. 14, 1915. Coumarone products are used as carrying agents, either by themselves or in the most varied mixts., also with nitrogenous substances as well as in mixts. in which liquid O or liquid air is used as explosive. A mixt. is prepd., e. g., from 70 parts by wt. of nitroguanidine and 30 parts by wt. of coumarone resin; or 40 parts by wt. of  $\text{NH}_4\text{ClO}_4$ , 30 parts of  $\text{NH}_4\text{NO}_3$ , and 30 parts of coumarone resin.

Liquid air explosives. ERNST KOHLER. Ger. 305,850, Oct. 22, 1915. In front of the blast hole, liquid air is poured directly from the portable flask into carbon-carrier cartridges by means of a device which enables the entire cartridge to be quickly filled. Into the cartridge a small tube is inserted which carries at the top a filling funnel and is provided with a plurality of holes which enable perfect distribution of the liquid air throughout the entire carbon carrier of the cartridge in a short time. The process is also applicable to carbon carriers which, like soot, are of dense nature and oppose relatively high resistance to the penetration of liquid air.

High explosive containing wet nitrocellulose. W. R. SWINT. U. S. 1,373,844, Apr. 5. An explosive adapted for use in mines or torpedoes is formed of wet nitrocellulose of a high degree of nitration (preferably containing about 13–13.5% N) mixed with about 40–60% its wt. of a liquid nitro compd. such as nitrated "solvent naphtha" and with  $\text{NaNO}_3$ ,  $\text{KNO}_3$  or  $\text{Ba}(\text{NO}_3)_2$ . Cf. C. A. 15, 599.

An explosive capable of being exploded by means of mercury fulminate without residue of nitric acid. J. D. RIEDEL. Ger. 301,799, Dec. 24, 1914. As a substitute for  $\text{HNO}_3$  in explosives, alkylchloroamines are serviceable. These can be prepd. in a simple manner from  $\text{CaOCl}_2$  and monoalkylamine-HCl in the manner set forth by Tscherniak (*Ber.* 1876, 143). They are capable of violent explosion at normal temp. by an initial impulse (e. g., by Hg fulminate). With these substances kieselsguhr or a similar material is satd.

Smokeless tubular powder for guns. C. CLAESSEN. Ger. 298,566, Dec. 7, 1915.

This tubular powder is of such short length that even when it is quite ready for use, its surface can be treated for the purpose of regulating its ballistic properties.

**Heavy-metal azides as explosives.** OSKAR MATTER. Ger. 310,060, Aug. 26, 1917. To an aq. soln. of a heavy-metal acetate there is gradually added a soln. of aq. HN<sub>3</sub> or a metal azide. Example: Into a filtered soln. at normal temp. contg. 6 kg. Pb(OAc)<sub>2</sub>·3H<sub>2</sub>O in 120 l. H<sub>2</sub>O and 80–100 cc. HOAc in an open vessel fitted with stirring app., there are gradually run 100 l. of 2% aq. NaN<sub>3</sub> soln. at normal temp. The period of admission of the NaN<sub>3</sub> soln. is 4–5 hours. After the reaction has been completed, the vessel is emptied, the PbN<sub>3</sub> crystals formed are collected on a filtering cloth, washed with cold H<sub>2</sub>O to neutral reaction and dried at 40–50°. About 4.460 kg. of PbN<sub>3</sub> is obtained.

**Detonator.** WRSSTFÄLISCH-ANHELTISCHE SPRENGSTOFF-ART.-GHS. Ger. 291,830, Apr. 25, 1915. The detonator consists of dinitroalkyloxanides, more particularly dinitrodimethyloxamide.

**Impregnating match-splints.** J. P. BENNETT. U. S. 1,372,860, Mar. 29. Match splints are dusted with a "glow-detering" powder such as ammonium phosphate and are then steamed to cause the powder to dissolve and impregnate the superficial portion of the splint.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

The color laboratory of the United States Bureau of Chemistry. H. D. GIBBS. *Chem. Met. Eng.* 22, 405–7(1920).—This paper is a summary of the varied problems investigated.

H. G.

**Azo developers.** OTTO AND EMIL SCHLEIN. Sealed notes Nos. 1681 and 1743 deposited Dec. 5, 1906 and May 21, 1907 resp. by LUDWIG LICHTENSTEIN. *Bull. soc. ind. Mulhouse* 86, 486–9(1920). Report by PIERRE BINDER. *Ibid* 488–93.—In the diazotization of *p*-nitroaniline NaAcO is used to neutralize the HCl but on account of the high cost of NaAcO l. suggests a partial neutralization of the HCl by Na<sub>2</sub>CO<sub>3</sub> and completing the neutralization by NaAcO. This procedure gives good results in the prepn. of *p*-nitroaniline red,  $\alpha$ -naphthylamine garnet, etc. The use of NaOH, CaCO<sub>3</sub> or MgCO<sub>3</sub> in place of Na<sub>2</sub>CO<sub>3</sub> gave fair results. The proportions of Na<sub>2</sub>CO<sub>3</sub> and NaAcO to be used are worked out with much detail based on a titration of the HCl in the diazotizing soln.

L. W. RIGGS

**Discharge on brown of *p*-phenylenediamine.** HENRI SCHMID. Sealed note No. 1504, Nov. 9, 1904. *Bull. soc. ind. Mulhouse* 86, 477–8(1920). Report by CHARLES SUNDER. *Ibid* 481–2.—*p*-Phenylenediamine has been employed up to the present in dyeing only when mixed with aniline to obtain by oxidation the ungreenable black. Schmid proposes to use it as an individual dye. When so used each liter of the dye bath should contain 30 to 40 g. of *p*-phenylenediamine hydrochloride in the form of the white salt, NaAcO in amt. sufficient to discharge 50 to 75% of the HCl, 25 to 30 g. NaClO<sub>4</sub>, and 1 to 10 mg. ammonium vanadate. The latter should not be added until the bath is about to be used. [In a later note S. omits the vanadium compd.—ABSTR.] A slight addition of "hydrosulfite-formaldehyde (NF)" renders the bath nearly colorless and diminishes the rate of oxidation. Foulard textile after dyeing in this bath turns gray-violet, bluish or green during drying. These dyes are decolorized by white discharge on para red by "hydrosulfite NF", which is printed on the dry textile. The goods are then passed to the Mather-Platt steamer and degummed in boiling water. Discharge on brown of paraphenylenediamine by aid of alkaline ferrocyanides. *Ibid* 478–9(1920).—Schmid adds to sealed note No. 1504 that the oxidation of *p*-phenylene-

diamine on the fiber, in the case of making an illuminated article, may also be done by yellow prussiate. Sixteen g. *p*-phenylenediamine is added to 1 liter containing 20 g.  $\text{NH}_4\text{Cl}$ , 20  $\text{NaClO}_2$ , and 20  $\text{K}_4\text{Fe}(\text{CN})_6$ . The addition of 1.5 g. rongalite C to this bath is optional. After a few hrs. the bath is almost colorless. It is filtered and the foulard passed. The bath keeps in a closed vessel several days. **White and colored discharge on oxidation browns** analogous to aniline black. Sealed note No. 1517, Dec. 30, 1904. *Ibid* 479-80 (1920). Report by CHARLES SUNNER. *Ibid* 483.—The bath for brown of *p*-aminophenol should contain in each liter *p*-aminophenol hydrochloride 40 g., 50%  $\text{AcOH}$  5 g.,  $\text{K}_4\text{Fe}(\text{CN})_6$  30,  $\text{NaClO}_2$  25,  $\text{NaAcO}$  4 to 5. The  $\text{AcOH}$  retards the formation of a brown ppt. If this ppt. is formed the bath must be filtered; the  $\text{NaAcO}$  partly neutralizes the bath to prevent tendering the fiber. White reserve is made by printing a mixt. of sulfite and acetate on dry fiber. The goods are then steamed in the Mather-Platt, washed and soaped. The bath for *o*-aminophenol should contain in each liter *o*-aminophenol crystals 40 g.,  $\text{HCl}$  20%, 40 cc.,  $\text{K}_4\text{Fe}(\text{CN})_6$  30 g.,  $\text{NaClO}_2$  25. Other details as with the para compd. The brown is less fast to soap than brown from the para compd. *m*-Aminophenol under similar conditions gives an olive brown; amidol a bistre and *o*-anisidine brown to black.

L. W. RIGGS

**More thermometers in the dyehouse!** ANON. *Deut. Färber-Ztg.* 57, 249-50 (1921).—In this paper the advantages of more accurate temp. specification and control in the dyeing process is emphasized.

L. W. RIGGS

**Dyeing of worsted piece goods.** LOUIS J. MATOS. *Textile World J.* 58, 2069-71 (1920).—This article covers the handling of the stock from grease wool to dyed cloth. Rather minute details are given for the various operations, such as: bowl charges and temps. for scouring the grease wool; selection of oil for oiling the stock; cloth scouring; carbonizing acid sp. gr. and dryer temps.; dry milling; neutralizing; wetting out the cloth for dyeing; selection of either acid or chrome dyes from the Fall 1920 Shade Card; dyeing temps. and formulas; etc.

CHAS. E. MULLIN

**Steam waste in bleaching and dyeing.** J. A. BUTLER. *Textile World J.* 59, 2107 (1921).—A comparison of the efficiencies and costs of various methods of heating and circulating process liquors.

CHAS. E. MULLIN

**Wool bleaching.** ERNST ROT. *Deut. Färber-Ztg.* 57, 227-8 (1921).—Details are given for bleaching wool by means of sulfurous acid and permanganate, also by means of  $\text{Na}_2\text{O}_2$ .

L. W. RIGGS

**Waterproofing linen.** JULIUS SCHMIDT. *Deut. Färber-Ztg.* 57, 201-2 (1921).—Waterproofing linen by means of  $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$  is described.

L. W. RIGGS

**New procedure for obtaining crape and other similar effects on cotton by mercerizing** ALBERT LIEBMAN. Sealed note No. 1478, May 24, 1904. *Bull. soc. ind. Mulhouse* 86, 484 (1920).—Report by THIEBAUT BAUMANN. *Ibid* 485.—The process consists in drying locally, by a special app., a wet fabric strongly pressed by a calender, then passing the fabric into a soln. of  $\text{NaOH}$  36° Bé. The goods are then rinsed, acidified and again rinsed. It is observed that the wet places are mercerized, whereas the  $\text{NaOH}$  does not penetrate the dry areas. A pronounced crape effect results. The process succeeds if the fabric is boiled in a dil. soln. of  $\text{Na}_2\text{CO}_3$ , and then bleached in active  $\text{Cl}$ . Upon fabrics boiled in  $\text{NaOH}$ , which are very hygroscopic after bleaching, the process is not successful.

L. W. RIGGS

**Carbonization of fire hose due to water streams of high velocity.** JOHN S. CALDWELL. *Quart. Nat. Fire Protect. Assoc.*, Jan. 1921, 218.—This was noted in connection with the use of a motor pumping engine by the Fire dept. of Boston, Mass. Duplicate tests showed that the carbonization of the cotton jackets in this cotton rubber-lined fire hose was not due to the type of pump used. Factors which influence the condition are discussed.

F. DANNERTH

**Acid corrosion of hose linings and jackets.** L. B. BUCHANAN. *Quart. Nat. Fire Pro-*

*text. Assoc.*, Jan. 1920, 263.—A discussion of the formation of free sulfuric acid in cotton rubber-lined fire hose.

F. DANNERTH

**The commercial utilization of African wild silk.** ANON. *Bull. Imp. Inst.* 18, 319-23 (1920).—The tough parchment layer of the envelopes can be degummed satisfactorily by boiling them with a weak alk. soln. On removing the silk from the soln. the softened gum should be removed as far as possible by pressure or other means. It is also of advantage to reboil or rinse the silk in the hot soln. for a few min. The product is then hoiled in soap soln. The silk is finally washed well with hot  $H_2O$  and dried. The gum is not completely removed by the alkali treatment unless unduly prolonged but the portion remaining becomes softened and is subsequently extd. by the soap soln. The soap treatment also improves the color and luster of the silk. It was found that the irritant action of the raw silk was much diminished by boiling the envelopes for 2 hrs. with a 1%  $Na_2CO_3$  and then washing and drying or by immersing in 1%  $NH_4OH$  for 24 hrs.

R. L. SIBLEY

**Fiber of Hibiscus cannabinus.** ANON. *Bull. Imp. Inst.* 18, 430-2 (1920).—The fiber of this plant consists of the bast layer of the stem; it is prepd. by a process of retting similar to that adopted for jute. The compn. of the fibers (calcd. for the dry fiber) is: ash 0.7%,  $\alpha$  hydrolysis loss 13.1%,  $\beta$ -hydrolysis loss 19.7%, acid purification loss 3%, cellulose 73%, loss on washing in  $H_2O$  2.3%. The substance is inferior to ordinary jute in view of the greater hydrolysis loss.

R. L. SIBLEY

**Microscopical examination, chemical constituents, and reactions of "ashi" (a kind of reed) fiber.** MORITSUGU ISHIKAWA. *J. Chem. Ind. Japan* 23, 1153-7 (1920).—Detailed microscopic examn. of Korean "ashi" was made as to size, shape and positions of the cells and microchem. reaction with various reagents. In general it resembles straw, but it can be distinguished from the latter on account of the fact that this fiber is shorter and wider than that of straw. Chem. analysis shows it to contain 11.2%  $H_2O$ , 3.78%  $H_2O$ -sol. matter, 1.24% ash, 0.96% fat and wax, 14.7% lignin, 49.8% cellulose, and 18.32% pectin, etc. Reaction with magenta- $H_2SO_4$ , Cu value, hydrated value, and furfural values of the fiber are compared with those of cotton, sulfite pulp, Japanese straw and imported straw (European pulp). The conclusion is that "ashi" is very similar to the imported straw both in respect to shape and chem. compn., but contains less lignin than the latter.

S. T.

The anilides of  $\beta$ -hydroxynaphthoic acid (BRUNSKILL) 10. Pyrrole blacks (ANGELI, LUTRI) 10. "Furol green" (FISCHER, GRAHL) 10. Silicate soap for the paper and textile industries (Ger. pat. 320,829) 27.

BARNETT, E. DE BARRY: Anthracene and Anthraquinone. London: Bilière, Tindall and Cox. 27s. 6d. net. For review see *Chem. Trade J.* 68, 349 (1921).

**Deutscher Färberkalender 1921.** 30th year. Compiled by the editors of *Färber-Ztg.* Wittenberg: A. Ziemsen. M12. For review see *Chem.-Ztg.* 45, 304 (1921).

HEERMANN, PAUL: *Technologie der Textilveredelung.* Berlin: Jul. Springer. 564 pp. M120. For review see *Chem.-Ztg.* 45, 371 (1921).

WHITWAM, J. H.: *Textile Calculations.* London: Sir Isaac Pitman and Sons. 25s. For review see *Am. Dyestuff Rep.* 8, 31 (1921).

WOOLMAN, MARY S., AND MCGOWAN, ELLEN B.: *Textiles.* New York: The Macmillan Co. 428 pp. For review see *Chem. Weekblad.* 18, 238 (1921).

**Preparation of indigoid dyestuffs.** KALLE AND CO., AKT.-GES. Ger. 292,360, Nov. 15, 1912. Addition to 292,569, Feb. 16, 1913. As parent materials are used the arylaminonaphthols or naphthimidazoles substituted in the amino group of amino-

naphthols with free *o*-position, or their derivs., heteronuclear acyl and urea derivs. of aminonaphthols, their substitution products and homologs, with exclusion of 1-acetyl-amino-5-hydroxynaphthalene. The above mentioned products are condensed with  $\alpha$ -isatin derivs., which are to be understood to include also their nuclear substitution products, homologs and analogs. The dyestuffs obtained in this manner are treated in certain cases with halogen.

**Disazo dye.** T. H. LEAMING. U. S. 1,372,439, Mar. 22. A disazo dye is formed from 1,8-aminonaphthol-4-sulfonic acid, coupled in sep. steps with 2 mols. of acetyl-*p*-phenylenediamine with removal of one Ac group. The Na salt of the dye is a reddish black powder sol. in  $H_2O$  with a green-blue color, sol. in alc. with a blue color, sol. in dil. alkali with a blue color and in concd.  $H_2SO_4$  with a blue-green color. It dyes cotton, wool and natural or artificial silk or their mixts. greenish shades of black, which can be developed on the fiber.

**Nitrogenous condensation products of the anthraquinone series.** BADISCHE ANILIN-UND SODA-FABRIK. Ger. 329,246, May. 19, 1914. 2-Arylaminoanthraquinones, their derivs., homologs or substitution products, or derivs. of anthraquinone substituted in the 2 position, such as the sulfonic acids or halogen derivs., which in the conditions of reaction are capable of being converted into 2-arylaminoanthraquinones, are heated to relatively high temps. with primary aromatic amino compds. in the presence of alk. condensation agents, preferably in the presence of oxidizing agents, more particularly O or air.

**Nitrogenous condensation products of the anthraquinone series.** BADISCHE ANILIN-UND SODA-FABRIK. Ger. 329,247, June 16, 1914. 1-Haloanthraquinones, including those which in *o*-position to the halogen atom contain substituents capable of reaction, or derivs. of these substances with *o*-aminodiarylamines or their nuclear substitution products, are heated, by themselves or in inert solvents or suspension agents, with or without addition of acid-binding agents and catalytically acting materials.

**Dyeing.** SURPASS CHEMICAL Co., Inc. Brit. 158,531, Sept. 10, 1920. Cotton goods containing moles, shives, or leaf, are first dyed and then an alk. oxidizing agent is added to the bath to destroy the impurities. Suitable alk. oxidizing agents are the mixts. of soda ash, NaOH,  $Na_2SiO_3$  or  $Na_2HPO_4$  with  $Na_2O_2$ , percarbonate, perborate, persulfate, or persulfate, or  $H_2O_2$ ; or  $Na_2O_2$  may be used alone. The substantive dyes, or mixts. thereof with vegetable dyes, are suitable. Cf. 103,445 (C. A. 11, 1556).

**Dyeing cellulose acetate.** BRITISH CELLULOSE AND CHEMICAL MANUFACTURING Co., Ltd. Brit. 158,340, Oct. 31, 1919. In dyeing fibers, threads, or fabrics of cellulose acetate, the material is treated with  $NH_4SCN$  prior to dyeing, or  $NH_4SCN$  is added to the dye-bath. Instead of  $NH_4SCN$ , Na, K, Ca, etc., thiocyanates may be used. Examples are given of dyeing with acid wool dyes, basic dyes, substantive cotton dyes, and vat dyes. Mixed goods contg. cellulose acetate and cotton, wool, silk, etc. may be treated by the process, either by cross-dyeing or by using a dye which the two fibers absorb in the presence of the thiocyanate.

**Dyeing and waterproofing fabrics.** A. O. TATE. U. S. 1,374,122, Apr. 5. Fabrics such as cotton or silk are impregnated with ordinary aniline-black dye-stuffs, aged and then treated with Na palmitate and an Al salt such as acetate or sulfate and subjected to the action of an elec. current while passing between electrodes, one at least of which is formed of Al.

**Composition for use in dyeing.** R. A. PHAIR. U. S. 1,372,038, Mar. 22. A dry mixt. of Na silicofluoride 10 and oxalic acid 1 part is used for regulating the rapidity of action of dye baths. Other organic acids or acid salts may be used instead of oxalic acid.

**Apparatus for mercerizing cotton yarn.** J. SPITZER. U. S. 1,374,118, Apr. 5.  
**Yarns; fabrics.** SOC. LA SOIE ARTIFICIELLE DE LA VOULTE. Brit. 158,851, March

27, 1920. Preservative substances are formed in the body of threads, either unwoven or woven into fabrics, by the interaction of appropriate gaseous reagents. *E. g.*, resins are formed by the action of ozonized air or HCHO upon threads which have been exposed to turpentine vapor or phenol vapor, resp., under reduced pressure. Volatile org. acids, such as formic or HOAc, may be used when their presence is required. The process is particularly adapted for use in connection with threads the strength of which is impaired by moisture, such as artificial silk, and has a waterproofing and strengthening effect.

**Retting-flax, etc.** B. S. SUMMERS. Brit. 158,807, May 1, 1920. In retting flax, etc., the proportion of useful bacteria to putrefaction bacteria is increased by circulating the retting liquor from the vats through a filter in which the insol. products of fermentation, which act as culture for the putrefaction bacteria, are collected. The filtered liquor is titrated from time to time against a standard soln. of  $\text{KMnO}_4$  by which means the proportion of org. content is detd. and the use of a retting liquor of standard strength is made possible. The filter also collects a certain quantity of useful bacteria and may thus be used to inoculate fresh retting liquor. The used filter may be dried and screened and the screenings used as a fertilizer.

**Artificial silk.** H. SINCLAIR. Brit. 157,111, Jan. 8, 1921. In the manuf. of viscose silk—(1) the control pumps are dispensed with, and in place thereof there is interposed between the last filtering element and the squirting nozzle a reservoir, from which the viscose soln. is forced to the nozzle by air under pressure; the three reservoirs employed with each machine are operated in such a manner that one is supplying viscose, the second is charged ready for squirting and the third is filling; each reservoir comprises a cylindrical portion and end portions of reduced diameter, and during working the upper and lower limits of the level of the soln. are arranged to be at these portions so that only relatively small surfaces of liquid are exposed to the air for any prolonged period; the supply and discharge pipes for the soln. and the compressed air are connected to these reduced portions, that for the supply of soln. opening at a point above the discharge so that contamination of a fresh charge with the residue of the previous charge is obviated. (2) Immediately in advance of each squirting nozzle is arranged a control device for rendering const. and independent of the temp. of the spinning bath the supply of soln.; it consists of a plate, having an aperture of a size detd. by the capacity of the sum of the spinning apertures. (3) To obtain more regular effects during washing, bleaching and drying, the skeins of silk during all these operations are carried on a bobbin capable of being expanded. The bobbin is constructed entirely of acid- and alkali-resisting material such as paraffined wood, compressed lacquered paper, hard ebonite, or "gumite." A suitable construction is specified.

**Treating fibers.** J. O. W. GIERISCH, P. M. KRAIS and H. P. WAENTIG. Brit. 157,840, Jan. 10, 1921. In the production of single fibers from bast fiber bundles, with simultaneous disintegration and removal of the wood particles and crusts, the material, as previously soaked raw fibers, as raw threads or raw fabrics, is treated with chlorine, scoured, then treated with dil. alk. solns., such as 5% soda lye, again scoured and then dried. The process is applicable to the treatment of flax, hemp, typha, broom, hops, and nettles.

**Balloon fabrics, etc.** C. A. CLEGHORN. Brit. 158,366, Nov. 4, 1919. In making the balloon or like fabric described in 142,160 (C. A. 14, 2718), the Turkish birdlime thinned as described in 130,379 (C. A. 14, 105), is applied to a sheet of fabric and dried at a temp. of about 180° F. and the adhesive waterproof coating, *e. g.*, shellac, varnish or rubber soln., is applied to the dried birdlime. If rubber soln. is used, it may be utilized to secure a second sheet of fabric to the birdlime, or it may be allowed to dry and then be vulcanized or coated with shellac varnish.  $\text{HgCl}_2$  may be added to the birdlime as a preservative.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Metal protective paints.** HENRY A. GARDNER. *Trans. Am. Electrochem. Soc.* 39, preprint(1921).—In designing protective paints the following principles should be observed: (1) Basic substances in sufficient concn. inhibit the corrosion of Fe; effective basic pigments are  $\text{PbO}$ ,  $\text{Pb}_2\text{O}_3$ , basic Pb sulfate,  $2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$ , and  $\text{ZnO}$ . (2) Sol. dichromates even in great diln. prevent the corrosion of Fe; chromate pigments:  $\text{Pb} \cdot \text{CrO}_4 \cdot \text{PbO}$ ,  $\text{PbCrO}_4$ ,  $\text{ZnCrO}_4$ . (3) Inert pigments such as Fe oxides, china clay,  $\text{SiO}_2$ , talc and  $\text{BaSO}_4$ , which do not excite corrosion, produce with linseed oil very durable films. (4) Substances that form a galvanic couple with Fe in the presence of moisture cause rapid corrosion: lamp black and graphite are used only as constituents of the finishing coats. These C pigments with linseed oil form very durable, water-resisting coatings. Zn and Al bronzing powders applied directly to steel surfaces possess much greater rust-preventing properties than the powders of other metals such as Cu. A high-grade exterior spar varnish should be used for suspending the powders. (See also *Chem. Met. Eng.* 24, 843, 931(1921).) C. G. F.

**Anti-corrosive preparations for iron and steel.** "LATRX." *Chem. Age* (London) 4, 367(1921).—A brief review of the theories of corrosion. The author has high regard for a coating of properly selected asphaltic paint. F. A. WERTZ

**The manufacture of ultramarine blue.** M. SAUVAGROT. *Rev. prod. chim.* 24, 141-8, 205-12(1921).—General description of the raw materials employed and of the method of manuf. of ultramarine blue, together with tables giving 22 analyses of blues and 3 analyses of ultramarine green and a brief mention of some of the modern theories on the constitution of ultramarine and of the improvements which should be effected in the mfg. process. A. P.-C.

**The identification of varnish gums.** P. NICOLARDOT AND CH. COFFIGNIER. *Chimie et industrie* 5, 150-6(1921); cf. *C. A.* 14, 3805.—A study of the hardness of gums and resins used in the manuf. of varnishes, with a view to their classification. The hardness was tested by means of a tester devised for the study of the hammer-hardening of metals. A (presumably metal) ball 1 or 2 mm. in diam. is pressed against the sample for the desired length of time under a given load. The diam. of the impression may be measured by means of a dividing machine, a microscope with a micrometer, or a LeChatelier app. by means of which the size of the magnified impression is measured directly. The total load applied to the material is weighed directly. A device is provided for applying the load (which may vary from 0.5 to 50 kg.) with practically no momentum. Tests were carried out at 0° and 25° and at room temp., the latter being important as they correspond to the condition of the varnishes under actual working conditions. Most tests were made with a 2-mm. ball under a load of 5 kg., and some with a 1-mm. ball under a load of 2 kg.; the length of time during which the load was applied was 5 sec., 1 and 10 min., 3.5, 14, and 38 hrs. In the case of certain soft gums it is important that the impression be measured as soon as possible after removal of the load; but in most cases the dimensions of the impression are unaltered after quite a long time (up to 3 mos.). The results are expressed as the diam. of the impression in mm. when magnified 44.5 times. The results of numerous tests are given, made at room temp. with a 2-mm. ball under a load of 5 kg., acting for 5 sec., 1 and 10 min., 1, 3.5, 14 and 38 hrs.; at room temp. with a 1 mm. ball under a load of 2 kg. acting for 5 sec., and 1 and 10 min.; and at 0° and 25° with a 2-mm. ball under a load of 5 kg. acting for 5 and 10 sec. Tables are also given showing the d., m. p., acid no., Koettstorfer no., and initial (5 sec.) and final (10 sec.) hardnesses of several of the resins. Zanzibar, Madagascar and Demerara copals are classed as hard; Congo, Benguela, Cameroon, red Angola-Kissel, Brazil, white Angola, and Sierra Leone copals as semi-hard; *Aucoumea klain*

*eana*, *Hopea odorata*, *Hopea dealbata*, and the other dammars as soft; and amber, kauri copal, Manila copal, Pontianac copal as miscellaneous. Results of tests previously carried out on the solubility of the gums in various solvents are summarized. (See Ch. Cofignier, *Bull. Soc. Chim.*, 1902 to 1914.) A. P.-C.

**Nitrocellulose lacquers.** R. O. HERRZOG, A. HILDESHREIMER AND F. MENICUS. *Z. angew. Chem.* 34, Aufsatzteil, 57-60(1921).—The authors present results of expts. on the use of various softening agents to impart elasticity and other desirable properties to nitrocellulose lacquers. Films contg. varying quantities of a large no. of these softening agents were prepd. and examd. according to the method of Gibson and Jacobs (*C. A.* 14, 2431) for elasticity, tensile strength, hardness, effect of low temp. and of  $H_2O$ , etc.; results are given in detail. Films best in all respects were obtained by addition of 1.5 parts amyl cinnamate to 1 part nitrocellulose. This addition does not produce the highest initial elasticity but such films retain their elasticity for a much longer time. Elongation of films contg. 1 part nitrocellulose to 1.5 parts of the following more satisfactory softening agents are: amyl cinnamate, 150%; monoacetin, 140%; glycol methylcoumarate, 125%; tricresyl phosphate, 115%; castor oil, 115%; triphenyl phosphate 100%; amyl dihydrocinnamate, 100%. Some of these films, however, become brittle at low temps. and have other undesirable properties. Combinations of softening agents, such as equal parts of "escon" (ethyl acetylsalicylate) and of glycol salicylate, often give elastic films while either used alone produce films that are easily shattered on bending. Formanilide and formotoluidide impart high initial elasticity but unless used in combination with amyl cinnamate, "palatinol" (ethyl phthalate), or other corrective agent, have a tendency to crystallize out, and the film suffers deterioration in elasticity. The chem. constitution of the addition agent seems to have a great effect on the elasticity and strength. Double bonds appreciably increase elasticity; long HC chains increase strength. Certain properties may be enhanced by a systematic change of the addition agent; thus the brittleness at low temps. of a film to which a fatty glyceride has been added, may often be overcome by substituting the glycolate of the same fatty acid. The increase in brittleness with age is due in most cases to a slow evapn. of the softening agent; in others, such as those where furfural is present and has resinified, to chem. change. The increase in elasticity with age which is sometimes obtained can only be ascribed to chem. action between nitrocellulose and addition agent.

F. A. WERTZ

**Radiant colors.** O. PRAGER. *Seifensieder-Ztg.* 46, 171, 209(1921).—A brief survey is given of photoluminescent sulfides, their prepn. and use. The following method of prepn. is typical: oyster shells are first cleansed by prolonged boiling in  $H_2O$ , then dried and heated to redness; the product is freed from foreign incrustations and then powdered and mixed with pulverized charcoal and placed into a clay crucible in alternate layers with S flowers. The crucible is covered, carefully luted and heated to  $1200^\circ$  for about 1 hr. It is opened only when cold. The product is finely powdered and sold or it is mixed with  $BaSO_4$  with lacquers of natural colors, or with boiled oil free from metallic driers. The comparatively impure oyster shells are said to give a better CaS color than pure  $CaCO_3$ . For 80 pts. of shells about 12 pts. S are used; from 0.01 to 0.05%  $Li_2CO_3$  together with other metallic salts are frequently added.

P. ESCHER

**Some synthetic resins from furfural.** GERALD H. MAINS AND MAX PHILLIPS. *Chem. Met. Eng.* 24, 661-3(1921).—With the improvement of the processes for production of furfural cheaply from corncobs, resins made from it become of economic importance. The optimum conditions for the production of fusible resins for use in varnishes by condensation of furfural with amines, ketones and other compds. are given. Of these resins those obtained from aniline,  $\alpha$ -naphthylamine, xylylidine,  $Me_2CO$ ,  $MeEtCO$ ,  $NH_4OH$ , and  $NaOH$  can be produced cheaply enough to be of practical importance. The resins are partly sol. in turps, sol. in  $C_2H_4$ ,  $Me_2CO$ , and alc., and very



sol. in furfural. These solns. may be used as varnish stains to produce various stained effects with glossy surfaces on wood. (Cl. C. A. 14, 642.) F. A. WERTZ.

Colloidal rosin. F. C. KRIST. *Seifensieder Ztg.* 48, 151 (1921).—Analysis of a much advertised "colloidal rosin" showed it to be a partially saponified crude German pine resin and to contain 58.65%  $H_2O$ . E. SCHMIDT.

The use of carbon tetrachloride as a fire extinguisher in oil factories. ANON. *Quart. Nat. Fire Protect. Assoc.*, Jan. 1920, 271.—A record of expts. on the use of  $CCl_4$  as a fire extinguishing agent on fires in kettles used for boiling linseed oil. F. DANNERT.

State legislation and carbon black manufacture (KIRCHER). 18. Resin-like substances from wood tar (Ger. pat. 320,620) 21.

Paint. H. N. WELLS. U. S. 1,374,128, Apr. 5. A paint adapted for use on fabrics or sound-proof material is formed of soap 9 oz., whitening 2.5 lbs., lime 23.25 lbs., NaCl 1.25 lbs. and  $H_2O$  4 gals.

Paint. C. S. HATHAWAY. U. S. 1,374,161, Apr. 5. A paint which will harden and is adapted for use on metal exposed to the weather is formed of water-gas tar mixed with other paint materials.

Employment of salts of seaweed (tang) for paints. NORSK TANGAKTIESELSKAB. Norw. 30,920, July 26, 1920. The paint is mixed with a solution of acid salts of tang. Drying oils may be added.

Paint pigment. TITAN CO. AKTIESELSKAB. Norw. 31,005, Aug. 16, 1920. The pigment consists entirely or in part of titanates of bivalent heavy metals the salts of which are colorless, such as Zn and Pb.

Zinc white. C. CLERC and A. NEMOUL. Brit. 157,860, Jan. 10, 1921.  $ZnCO_3$ , ZnO and ZnS are prepd. from any Zn-contg. material by the following reactions. The Zn ore, fume, etc., is first dissolved in acid, preferably HCl, and purified by known means. By passing  $CO_2$  in the presence of MgO or  $MgCO_3$  into the Zn soln.,  $ZnCO_3$  is pptd. while  $MgCl_2$ , if HCl was used to dissolve the ore, is formed in soln. After filtration and washing, the liquor is concd. and by the addition of MgO solid  $Mg_2OCl_2$  is formed, which is readily converted into HCl and MgO for re-use, by heating. ZnO may be obtained from the carbonate by calcination, but preferably by treatment with dil. NaOH or KOH soln. which is recovered by means of CaO from the resulting alkali carbonate. The pptd. ZnO is removed and dried and the soln. made by dissolving it in HOAc or dil. mineral acid is used to prepare ZnS. After the pptn. and removal of ZnS, the liquor is used again by redissolving a further quantity of ZnO or  $ZnCO_3$  and re-pptg. as sulfide. Alternatively the sulfide is prepd. by passing  $H_2S$  into a closed mixing device containing a suspension of excess of  $ZnCO_3$  in  $H_2O$ , or in a dil. soln. of HCl or Zn salt.  $H_2SO_4$  may be used in the place of HCl for dissolving the ore, but the latter is preferred since it enables the MgO and acid to be recovered readily.

Fumigant paint. H. A. GARDNER. U. S. 1,373,499, Apr. 5. A germicidal fumigant coating adapted for use on wood or other material in connection with paint or varnish is formed of a chlorinated  $C_6H_4$  deriv. such as commercial *o*-dichlorobenzene together with linseed oil or other paint or varnish vehicle.

Resins; varnishes. DEUTSCH LUXEMBURGISCHE BERGWERKE UND HUTTEN AKT.-GES. and S. HILPERT. Brit. 157,715, Jan. 10, 1921. To waste  $H_2SO_4$ , obtained in the purification of coal-tar oils, is added  $H_2O$ , and the whole is then extd. with a "benzo-hydrocarbon." The soln., or the resin obtained therefrom by evapg. the solvent, may be added to resinous lacquers to hasten drying.

Synthetic resins. CONDENSITE CO. OF AMERICA. Brit. 159,164, Nov. 17, 1920. Sol. fusible resins are obtained by heating phenol or its homologs with AcH or paraldehyde in the presence of an acid condensing agent, such as HCl or  $H_2SO_4$ . The product

is dehydrated, and the acid is removed, in the case of HCl by blowing in steam and in the case of  $H_2SO_4$  by neutralizing with an alk.-earth carbonate. The product may be rendered hard and infusible by adding  $HCHO$ ,  $(CH_3)_4N_4$  etc., and heating. Cf. 1921, 1908, 3496-8, 1911 (C. A. 5, 2185).

Lubricating, heating and lighting agents from so-called liquid resin (sulfate resin). JOHAN EINAR, ANDREAS MOLIN and KARI AUGUST SCHRÖDER. Norw. 31,007, Aug. 18, 1920. The resin is either distd. under pressure or heated under pressure, in some cases with elimination of the highly volatile constituents.

Recovering material from linoleum scrap. V. SCHOLZ, C. JAUER and TIEDERMANN. (Firm of.) Brit. 158,210, May. 29, 1920. Addition to 143,561 (C. A. 14, 2994). In the process of treating scrap linoleum, etc., with small quantities of org. solvents to enable it to be reworked, the scrap is submitted to the action of the vapor of the solvents under atm. or higher pressure, instead of to the action of liquid solvents as described in the principal patent. A suitable app. is specified.

## 27—FATS, FATTY OILS AND SOAPS

R. SCHERUBEL

Analysis of hydrolyzed fats. W. FAHRION. *Chem. Umschau Fette Öle Wachs Harze* 28, 59-9(1921).—The detn. of the degree of fat cleavage during the Twitchell process can be calcd. from the acid no. and sapon. no. (both made on the same sample) according to the equation  $\% = \frac{(100 \times \text{acid no.})}{\text{sapon no.}}$ . This equation contains 2 errors which nearly compensate each other: (1) The % is based on the product and not on the fat; for the latter the equation should read:

$$\% \text{ fat hydrolyzed} = \frac{(\text{acid no.} \times \text{mol. wt. of glycerides})}{580};$$

this error causes the result to be high. (2) For fatty acids free from neutral fat the expression  $x = \frac{(100 \times \text{acid no.})}{\text{sapon no.}}$  should equal 100, but for some unknown reason it always falls below 100, possibly because 2 mols. of unsatd. acid unite to form 1 mol. of a diacid by grouping the  $COOH$  radical of the one with the double-bonded C atom of the other. This error tends toward low results. Davidsohn proposed the formula  $x = \frac{(100 \times \text{acid no. of total fat})}{\text{neutralization no. of fatty acids free from unsapon.}}$ . P. suggests the equation:

$$x = \frac{[(100-y) \times \text{acid no. of total fat}]}{\text{sapon. no. of total fat}}, \text{ where } y \text{ is the \% of unsapon. matter and } x = \% \text{ free fatty acids.}$$

The neutral fat in this case would be  $100 - (x+y)$ . P. ESCHER  
What is meant by the degree of cleavage. F. C. KRIST. *Seifensieder Ztg.* 48, 267-8 (1921).—By a series of assumed cases which introduce some error, K. illustrates faulty calcs. and he proposes the expression:

$$x = \frac{(100 \times \text{acid no. of product})}{\text{neutralization no. of the crude fatty acids of the fully hydrolyzed fat}}$$

P. ESCHER

Recovery of oils and fats from industrial waters. J. BARTH. Berlin-Weissensee. *Z. deut. Öl-Fett Ind.* 41, 209-12(1921). Illus.—A description of catch basins with baffle-walls for the recovery of oil and grease from waste-waters. The app. was designed by the author.

P. ESCHER

Fatty oils from reptilia and Amphibia. MITSUMARU TSUJIMOTO and SHUMEI KOBAYASCHI. *J. Chem. Ind. (Japan)* 23, 1099-1109(1920).—Chem. and physical analysis of oils of the following sources are given. (1) Blubber oil from leather turtle ("osa-

game") *Delmochelys schlegelii* (German); (2) oil from red turtle (akaumigame), *Caretta olivacea*, Escholtz, collected from blubber and internal organs of the turtle; (3) two oils from "ishigame," *Clemmys japonica* T. and S. (a), blubber oil, (b), liver oil; (4) viper oil, from a Japanese viper, "mamushi," *Agkistrodon blomhoffi*, Boie; (5) oil from "Yamakagshi," a snake, *Natrix tigrina*, (Boie); (6) oil of "aodaisho," a snake, *Elaphe climacophora*, Boie; (7) Python oil, from *Python reticulatus* Schin; (8) oil from a giant lizard (varanus); (9) toad oil from "hikigaeru," *Bufo bufo japonicus* (Schlegel); (10) oil of giant salamander, *Megalobatrachus japonicus* (Temm.). The characteristics of these are respectively:  $d_{15}^4$  0.9252, 0.9249, 0.9219, 0.9210, 0.9192, 0.9194, 0.9139 (20°), 0.9165, 0.9132 (40°), 0.9348, 0.9244; acid value 2.0, 0.9, 4.1, 27.1, 0.4, 1.1, 0.9, 0.6, 21.0, 8.5, 1.2; sapon. no. 181.3, 192.8, 198.2, 191.5, 187.7, 195.8, 194.5, 194.1, 188.8, 181.3, 191.2; Wijs no. 128.1, 141.4, 103.3, 114.9, 110.8, 102.8, 86.5, 80.3, 101.0, 104.4, 141.4;  $n_{20}^D$  1.4753, 1.4763, 1.4723, 1.4740, 1.4723, 1.4715, 1.4697, 1.4685, 1.4647 (40°), 1.4742, 1.4765; unsapon. matter in %, 7.94, —, —, 1.98, 1.00, 1.22, —, 7.94, 0.97; m.p. of fatty acids, —, —, —, —, 34.5–5.5, 37, —, 31–2, —; ether-insol. bromide (%), 37.8, 31.0, 4.6, 5.4, 7.8, 11.2, 4.7, 2.1, 9.7, 1.0, 20.9; Br content of bromides (%), 70.66, 70.72, 66.87, —, 68.03, 68.50, —, 66.16, —, 67.86; Tortelli-Jaffe's reaction, blue-green, yellow-green, —, —, bluish green, orange-yellow, orange-yellow brownish yellow with green nuance, —, yellowish green. General conclusions are: The oils from reptilia and amphibia give ether-insol. fatty acid polybromides. The behavior of the bromides on heating was nearly identical with that of fish-oil bromides, showing that they contain highly unsatd. fatty acid. It is impossible to distinguish these oils from fish oil by the usual polybromide test (Marcusson and Huber). They do not contain the unsatd. hydrocarbon, squalene. The snake oils deposit a considerable amt. of stearin. S. T.

Composition of the head oil from sperm whale (*Physeter macrocephalus* L.). MITSUMARU TSUJIMOTO. *Report Tokyo Imp. Ind. Lab.* 15, No. 10, 1–80 (1920); *J. Chem. Ind. (Japan)* 24, 41–5 (1920).—The head oil of sperm whale is liquid *in situ* at the body temp. but becomes semi-solid after death. When pressed at room temp. this seps. into whale wax and head oil proper. A genuine crude oil thus sepd. is light yellow, and has the following characteristics:  $d_{15}^4$  0.8848, acid value 0.99, sapon. no. 147.1, Wijs no. 71.4,  $n_{20}^D$  1.4633, Reichert-Meissl value 0.57, unsapon. matter 36%, fatty acid 65%, glycerol 3.50%, cholesterol (total: digitonin method) 0.18%. The unsapon. matter, yellow white cryst. solid at 20°, m. 32–3, I value 51.3, and contains solid and liquid constituents. The solid unsapon. matter  $b_{15}$  197–205, m. 21.5–4°, sapon. no. 196. The free alc., m. 40–50, is cetyl alc.,  $C_{16}H_{34}O$ . It also contains cholesterol. The liquid portion of the unsapon. matter has I value 75, main constituent  $b_{15}$  215–20, sapon. no. 180.5. Free alc.  $b_{15}$  205–8°,  $d_{15}^4$  0.8527, solidifies—5°, m. 2–3, I no. 92,  $n_{15}^D$  1.4635,  $n_{20}^D$  1.4618. Analysis shows it to be octadecenol,  $C_{18}H_{34}O$ , (20% of the liquid oil). On hydrogenation, it changes to octadecyl alc.  $C_{18}H_{36}O$ , m. 58.5. This occurrence of octadecenol in the natural product is, according to T., the first on record. A fraction boiling at lower temp. contains probably pentadecyl alc. Of fatty acids, 19% is solid, and 81% liquid acid. The main parts of the satd. acids are palmitic and myristic acids, and trace of caprylic or capric acid. There is one unsatd. acid,  $C_{18}H_{32}O_2$ , whose properties are not the same as those of phytostolic acid reported by Holstädter (*Ann.* 177, (1854)) but whose structure is the same. It contains also a fairly large amt. of oleic acid, and a trace of one of the highly unsatd. acids, belonging either to the  $C_nH_{2n-8}O_2$  or  $C_nH_{2n-10}O_2$ . This oil, therefore, contains as main constituents esters of fatty acid and alc. glycerides and a trace of cholesterol ester. S. T.

Liver oils of sharks. Supplement. MITSUMARU TSUJIMOTO. *Report Tokyo Imp. Ind. Lab.* 15, No. 10, 81–7 (1920).—Squalene has been found in only 4 species of sharks outside of *Squalus*. The 5th species that contains it, is found in "Kikuzame," *Echinorhinus spinosus* (Gmelin). Its liver gave 59.7% oil. The portion h. up to 95° has  $d_{15}^4$

0.8806, acid value 0.14, sapon. no. 62.9, Wijs no. 260.2,  $n_{20}^D$  1.4878, butyrefractometer (20°) 96.9, and unsapon matter 68.55%. It contains 53.5% of squalene. "Midzuwani" one of *Squalus* genus gave 72.2% of liver oil. The portion b. 95, has  $d_{15}^4$  0.8930, acid value, 1.04, sapon. no. 0.31, Wijs no. 199.2,  $n_{20}^D$  1.4830, butyrefractometer (20°) 88.2 and unsapon. matter 46.61%. It contains 35.6% of squalene. The oil from other parts of the body does not contain squalene. Basking-shark, *Cetorhinus maximus* (Gunner) of Boshu, gave 61% liver oil. The portion h. 95° has  $d_{15}^4$  0.9094, acid value 0.55, sapon. no. 149.0, Wijs no. 167.3,  $n_{20}^D$  1.4808, butyrefractometer 84.3 and unsapon. matter 21.64%. It contains 13–8% squalene and 3.68% cholesterol. The difference in amt. of the squalene and cholesterol content between basking-sharks of Boshu and Idzu (cf. C. A. 14, 2866) is pointed out. S. T.

**Hardened fish oils.** J. Wolff. *Z. dent. Oel-Fett Ind.* 41, 179–80 (1921).—An examn. of numerous samples of oil received by a hydrogenation plant showed unsaponifiable matter varying from 0.1 to 20%. That from oils contg. 4 and 20% was sepd. and examd. and showed a partial melting at 25° and a final melting at 43° for the former, and 28° and 43° resp. for the latter. Its color was yellowish white and its consistency salve-like. The acetyl no. of the 1st group was 210 and 191 to 197 for the 2nd. The characteristics of the unsapon. matter indicate that it consists of walrus oil alc. of high cetyl alc. content. E. SCHERUBAT.

**Indian patchouli oil.** ANON. *Bull. Imp. Inst.* 18, 346–8 (1920).—Samples of patchouli oil (*Pogostemon*) were analyzed and gave the following results:  $d_{15}^4$  0.998,  $n_D^{20}$  1.515,  $[\alpha]_D^{20}$  —77°, acid value 1.0, ester value 5.3, sol. in 0.3 vol. 90% EtOH at 15°. The  $d$  and  $\alpha$  are slightly higher than for the com. oil from Singapore. R. L. SIBLEY.

**Indian kapok seed as a source of oil.** ANON. *Bull. Imp. Inst.* 18, 335–7 (1920).—The silk cotton known as Indian kapok is derived from capsules of *Bombax malabaricum*. The seeds contd. 8.0% moisture, and yielded on extrn. with petroleum ether 22.3% oil (equiv. to 24.5% from dry seeds). The oil is bright yellow and deposited stearin on standing. Analytical results are:  $d_{15}^4$  0.9208, acid value 9.3, sapon. value 193.3, I value 78%, sol. volatile acids nil, insol. volatile acids 0.5%, unsaponifiable matter 1.0%,  $n_{20}^D$  1.461, solidifying point of fatty acids 38°. The residual meal contd. moisture 11.4%, crude proteins 36.5%, fat 0.8%, carbohydrates 24.7%, fiber 19.9%, ash 6.7%, food units 118. The oil is suitable for refining for edible purposes. R. L. SIBLEY.

Centrifugal separation of oil emulsions (U. S., pat. 1,373,773) 21.

LEWKOWITSCHE, J.: *Chemical Technology and Analysis of Oils, Fats and Waxes*. Vol. 1. Edited by G. H. Warburton. 6th Ed. rewritten and enlarged. London: Macmillan and Co. 682 pp. 36s.

**Extracting oils.** P. L. FAUTH. *Brit.* 157,155, Jan. 8, 1921. In the extrn. of oil from seeds, etc., by benzine, the mass is pressed after each satn. with the solvent.

**Extracting oils.** K. FAESTER. *Brit.* 157,822, Jan. 10, 1921. Fish and like oils are extrd. by centrifuging the comminuted mass, preferably at 20–40° in a separator with a sharp-edged skimming pipe to divide and permit the continuous outflow of the residue.

**Extracting fat from cacao, etc.** C. A. FANKHAUSER. *Brit.* 158,844, Feb. 2, 1921. Oils and fats are extrd. from materials sufficiently liquid to flow under pressure, as for instance cacao butter from heated cacao, in an app. from which both the solid and the liquid constituents issue continuously. A suitable app. is specified.

**Recovering wool fat, etc.** W. BROADBRIDGE, E. EDGER and MINERALS SEPARATION, LTD. *Brit.* 157,490, July 18, 1919. Liquid or semi-liquid suspensions in liquids are treated in froth flotation app. of standard type used in mineral ore concn., for the sepn.

of certain constituents, such as wool fat from wool-washing waters. A suitable app. is specified.

**Extracting fat from garbage.** V. BRADLIX and L. C. WHITON, JR. U. S. 1,372,479, Mar. 22. Garbage or similar material which is to be treated with a solvent for extrn. of fats and greases is given a preliminary treatment of alternating pressure and vacuum in order to effect cell rupture before its treatment with the solvent.

**Purifying fats, etc.** E. I. DU PONT DE NEMOURS AND Co. Brit. 157,401, Jan. 10, 1921. Polymerized or partly oxidized cottonseed oil, soy-bean oil, or other vegetable or animal oils are deodorized by blowing dry steam or inert gas through the oil kept at 105–130° and under atm. or reduced pressure.

**Purifying fatty oils.** SUPERIOR OIL AND PROCESS Co. Norw. 31,006, Aug. 16, 1920. Fatty oils containing a considerable amt. of free fatty acids are treated with a H current in absence of hydrogenating catalyzers, the oil being kept not much below 185° (castor oil) or 250–300° (fish oil), resp. The H must not be allowed to remain long in contact with the oil and should not be of higher pressure than is absolutely necessary. A certain degree of hydrogenation will then take place, it is true, but it is insignificant; in any event, the substances which cause the unpleasant odor and taste are entirely eliminated.

**Refining vegetable oils.** A. SCHWARCMAN. U. S. 1,372,631, Mar. 22. *Linseed oil* or similar vegetable oils are purified by mixing with sufficient strong NaOH soln. to combine with the free fatty acids present in the oil, heating to about 83°, introducing hot H<sub>2</sub>O in finely divided form and removing the soln. at the bottom. U. S., 1,372,632 relates to a similar process for refining *castor oil*, followed by washing with hot H<sub>2</sub>O and drying.

**Compounding fats and oils.** H. WADE. Brit. 158,175, May 17, 1920. A homogeneous non-liquefying product is obtained by melting a "hard" fat, such as stearin, with preferably 3–6 times its wt. of fluid vegetable oils, such as cottonseed oil, soy-bean oil, or peanut oil, and cooling the melt slowly for at least 30 mins. with continual agitation from a temp. slightly above the m.p. of the hard fat to a temp. slightly below its point of solidification. The initial cooling may be rapid, but the final cooling, which in the case of stearin extends from 115–106° F. to 90° F., should occupy 30–60 mins. The process is facilitated by the addition of a small amt. of the previously formed congealed mixt., which acts as a starter, or by conducting the final cooling in a vessel already used for the purpose. Natural or artificial products containing stearin may be used instead of stearin alone.

**Distilling fatty acids.** J. W. BODMAN. U. S. 1,372,477, Mar. 22. In distg. fatty acids, such as stearic acid, to free them from dark color, they are sprayed *in vacuo* in contact with steam or a gaseous carrier under such conditions as to effect complete distn.

**Saponifying fats.** THOMAS ANYON. Ger. 319,856, Oct. 24, 1912. The fats are mixed with yeast to form an emulsion, and alkalies are added to the mixt. in the usual manner. Or the fats may first be mixed with the alkalies to the end of starting the saponification, and the yeast added before the completion of the saponifying process. The object of the yeast is greatly to accelerate the saponifying process, so that only about one-half of the usual time will be required. For fine soaps it is advisable first to free the yeast of impurities, especially of bitter elements, which is stated to be readily accomplished by light washing with dil. alkalies. The soaps thus obtained are claimed to possess increased cleaning properties. A mixt. of 60% yeast, 33% fat and 7% NaOH is claimed to yield a hard compact toilet soap.

**Soap.** C. S. TOWNSEND. Brit. 150,083, Jan. 7, 1920. Dried or liquid cheese whey is used as an ingredient of soap. Milk, skim milk, or buttermilk, dried or not, may also be added. 5–20% of the dried whey is suitable.

**Alkali soaps from mineral oils.** WALTHER SCHRAUTH. Ger. 327,048, Nov. 11, 1914. To produce soaps of superior lathering power, mineral oil fractions, preferably those fractions which are designated as illuminating oil and spindle oil, are first so chlorinated, in a manner not new in itself, that chiefly mono-substitution products will be formed. The chlorinated compds. are subjected at 200–300° to an alkali fusion in such a manner as to obviate the occurrence of high pressure.

**Silicate soap for the paper and textile industries.** THEODOR EUGEN BLASWILLER. Ger. 320,839, Apr. 11, 1919. Water-glass is used in such excess that silicic acid will not be pptd. The substance to be saponified is mixed with water-glass in a state of such fine subdivision that saponification will occur in the cold. The thickly liquid silicate soap may be reduced almost to dryness by the addition of fillers. Or a dry precipitant may be added to the soap. Example: 5 kg. of pulverized resin are kneaded with 120 kg. of water-glass of 38° Bé at normal temp., whereby sapon. is produced. The mixt. is then dissolved in cold or hot H<sub>2</sub>O. This soap soln. may be supplied to the paper-pulp bollander as required or used for dressing textiles. By addition of acid salts the resin silicate soap may then be made to be pptd. on the fibers. A filling of kaolin, China clay or talc may be used, so that the paper will be subjected to a loading process at the same time as the sizing process.

**Tar soap.** WERNER SCHMIDT and EMIL HEUSER. Norw. 30,954, Aug. 2, 1920. Wood tar which is to be converted into water-sol. tar soap is washed with H<sub>2</sub>O, in a manner not new in itself, before sapon. or subjected to distn. with or without steam to the end of being freed as far as practicable of volatile org. acids.

**Detergent.** R. MACPHERSON and W. E. HEYS. U. S. 1,373,900, Apr. 5. Vegetable materials such as ground maize are mixed in the cold, in pulverized form, with solid caustic alkali and just sufficient H<sub>2</sub>O to effect reaction without heating, in order to form a product adapted for use as a cleansing material.

**Sulfonated resin.** A. HORNWITZ. U. S. 1,373,886, Apr. 5. A H<sub>2</sub>O-sol. sulfonated resin adapted for use in soaps or in printers' ink is prepd. by treating resin with H<sub>2</sub>SO<sub>4</sub> and then removing excess H<sub>2</sub>SO<sub>4</sub> by the use of NaCl soln.

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

**Review of the most important articles in the field of pure sugar chemistry published during the second half of 1920.** EDMUND O. VON LIEPMANN. *Deut. Zuckerind.* 46, 37–8, 50–1, 63–4, 80–1, 95–6(1921); cf. C. A. 15, 326. F. W. ZERBAN

**Notes on the meeting of the commission for the new mill control, 1920.** J. VAN KORSVELD *et al.* *Arch. Suikerind.* 28, 1969–2004(1920).—This is a report on the discussions at the meeting, with a note explaining changes adopted in the new control methods. Tabulated results of the mutual factory control for 1918 and 1919 are also given, and are illustrated by graphs. F. W. ZERBAN

**New mill control.** F. R. BÖHTLINGK. *Arch. Suikerind.* 28, 2063–8(1920); cf. preceding abstract. —Further instructions for taking samples and for carrying out the control work are given. F. W. ZERBAN

**The early days of domestic sugar production, particularly in Bavaria.** CARL VON KLINCKOWSTORFF. *Deut. Zuckerind.* 46, 169–70, 194–5(1921).—Historical data concerning beet sugar, sugar from corn stalks, and maple sugar, from unpublished papers in the archives of the Bavarian Academy of Sciences, dating from 1799 to 1826, and from other sources listed. F. W. ZERBAN

**Glucose decomposition in white sugar manufacture.** J. W. L. VAN LIGTEN. *Arch. Suikerind.* 29, 18–20(1921); cf. C. A. 15, 958.—The protective effect of amino acids when reducing sugars are acted upon by alkalies may be utilized for the detection and

detn. of free OH. 500 mg. of asparagine in 100 cc. dextrose soln., giving a reading of  $+10^{\circ}$  V. in a 200-mm. tube, entirely prevent the effect of 5 cc. 0.107 N KOH during 4 hrs.' heating at  $50^{\circ}$ . F. W. ZERBAN

Investigations on the existence of glucose-salt combinations. W. D. HELDERMAN. *Arch. Suikerind.* 28, 2305-10(1920).—The expts. on sucrose-salt combinations (C. A. 15, 322) have been extended to systems containing dextrose and water on the one hand, and KCl, NaCl, and  $K_2SO_4$  on the other, at  $30^{\circ}$ . At this temp. there exist no chem. compds. of dextrose with these salts. It is possible that they do exist at lower temps., but this would be of no practical interest. F. W. ZERBAN

Causes of invert sugar formation and of the poor keeping quality of certain raw sugars. HERZFELD. *Deut. Zuckerind.* 46, 167(1921).—H. gives a review of recent articles on this subject (cf. C. A. 12, 777; 13, 1265, 2297, 2613; 14, 3334) and states that the moisture ratio of raw beet sugars of  $95^{\circ}$  polarization and of good keeping quality is as high as 0.7 to 1.1. For low-grade sugars the factor of safety is even higher. In sugars which have already been stored for some time and have lost water, the moisture ratio is somewhat lower, 0.6 to 0.7 or even less. The ratio was often not any less favorable in sugars containing invert sugar than in alkaline sugars, and the formation of invert sugar is due more to greater infection and to wrong methods of storage than to a high moisture ratio. The latter often varies considerably in sugars produced by the same factory, and better control should be exercised over it. F. W. ZERBAN

Sugar losses upon slaking lime with wash waters. P. BRYERSDORFER. *Z. Ver. Zuckerind.* 71, 75-87(1921).—The object was to ascertain whether or not sugar is destroyed when quick lime is slaked with a dil. sugar soln.; the further question, whether or not wash waters should be used for slaking lime, will depend, besides on the answer to the first question, on certain economic factors. A series of expts. gave the following results. When quick lime is slaked with a sugar soln., sugar is destroyed, the more of it, the better the quality of the lime. Relatively more sugar is decompd. in dil. than in concd. soln. Sugar is destroyed only during the actual slaking; milk of lime has no effect on sugar soln. at temps. below  $100^{\circ}$ . The sugar is not converted into caramel, but into acetic and lactic acids, etc. At high temp. products of the dry distn. of sugar are formed. When wash waters from the presses are used for slaking lime in the factory, from 10 to 20% sugar are destroyed; at the same time 1 part of lime is neutralized for every 3 parts of sugar destroyed. In practice it is better to slake the lime with water, allow to settle, decant, and dil. again with wash waters. F. W. ZERBAN

Comparative tests with sugar-beet seeds, made in 1919 by the Central Assoc. of the Czecho-Slovak sugar industry. *Z. Zuckerind. techoslovak. Rep.* 44, 105-12(1920).—Samples of seeds submitted by various firms were subjected to comparative tests. The moisture, amt. of foreign material, seeds under 2 mm., and the abs. wt. were detd. The no. of sprouting seeds within 7 days after planting and the total no. of sprouts after the 14th day per 100 planted seeds were also obtained on each sample. The yield of beets per hectare and their respective sugar content were detd. in each of 6 locations. The samples were then graded on the basis of all these results. JOHN M. KENO

Nitrites in sugar-house products. KARL URBAN. *Z. Zuckerind. techoslovak. Rep.* 44, 93-5(1919).—The source of the nitrites found in sugar-house products was sought for and their course through the process traced. An examn. of the sediment in the conduits leading from the kilns disclosed the presence of 0.10-0.53% of  $KNO_2$  in the water-sol. portion. The results of analyses of gas samples, taken at diff. intervals from the kilns, indicated that NO was constantly generated. The satn. gas after leaving the washers gave a strong test for nitrites, showing that the washing did not entirely remove them. Consequently it was expected that the juices treated with this gas would also give the reaction; this was confirmed by expt. The intensity of the test obtained

on the light juices depended on the amt. of carbonation the juice under examn. had received. The following filtration did not remove the nitrites. Even after concn. definite reactions were obtained. Nitrites in molasses were detd. by Devarda's reduction method and the results were found to be confirmatory of those obtained by Andrlík and Staněk (*Bohm. Zeit.* 1901-2, 228). Based on the results from the above expts., U. outlined the following explanation of the formation of nitrites. These evidently had their source in the strontia or lime kilns, usually fired with producer gas. The atm. N reacted directly with O at high temps. to form NO. This then entered the satn. gas and was carried by it into the light juice. According to Nernst's theoretical deductions concerning the production of HNO<sub>3</sub> from air, 0.1% of NO could be produced at 1500°. The higher the temp., the larger was the yield of NO. As the temp. for burning of strontia is known to be around 1250° and for lime 1080°, it is very probable that at certain places in the kiln higher temps. existed, thereby allowing the formation of NO.

JOHN M. KRNO

**The flora of deteriorating sugar.** W. J. TH. AMONS. *Arch. Zuckerind.* 29, 1-17 (1921).—In 1917, when more sugar than usual had to be stored in Java, serious deterioration was noticed in many sugars, and particularly high-grade sugars. Several samples were collected, and these were plated out on 2% agar made of distd. water and containing per liter 1.25 g. KCl, 2.5 g. peptone, 1 g. MgSO<sub>4</sub>, 1.25 g. Na<sub>2</sub>HPO<sub>4</sub> and 100 g. sucrose. The cultures obtained were then grown on sugar crystals. Very peculiar results were obtained, and it seemed that the number of microorganisms had no connection with the degree of deterioration (cf. C. A. 15, 1085). It is also impossible to say whether in a deteriorated sugar bacteria or fungi are more prevalent. No particular organism was found to be especially injurious. The bacteria isolated were similar to or identical with those previously described by Lewton-Brain and by Deerr (C. A. 2, 1629). All of them had the power of inverting sucrose. The following fungi were found and are described in detail: *Aspergillus niger*, *A. ficuum*, *A. oryzae* and *flavus*, *A. minimus*, and two new species, *A. fuscus* and *A. spadix*; *Penicillium glaucum*, *P. luteum*, and *P. rubrum*.

F. W. ZERBAN

**Recovery of ammonia, with little loss, in form of a concentrated, non-taking salt, from the saturation vapors and the evaporating station in the suganfactory Lübb, Mecklenburg.** A. DAHL. *Deut. Zuckerind.* 46, 209-10 (1921).—The vapors are drawn, by means of a fan, through a cylinder 7 m. high by 1 m. wide, which was made of wrought iron, but in practice would have to be made of stoneware or other acid-proof material. The lower part of the cylinder, to about 1/3 of its height, is, through a funnel in the top of the cylinder, filled with dil. HCl, which is atomized into the chamber above by means of an injector. The inlet pipe for the vapors is a little above the surface of the HCl. Perforated plates are placed just above the inlet pipe for the vapors, and just below the outlet pipe, to increase the effect of the spray. The NH<sub>4</sub>Cl soln. formed is drawn off continuously through a small overflow pipe, and HCl is added through the funnel whenever the liquor shows only a slightly acid reaction. The vapors are also tested for NH<sub>3</sub> at the fan. The NH<sub>4</sub>Cl soln. is evapd. and crysd., utilizing the heat of the flue gases. HCl was used on account of its low price, but other acids may be employed. From 600 tons of beets per day 42 kg. of crude NH<sub>4</sub>Cl, containing 13.4% N and some Fe and organic matter, were obtained.

F. W. ZERBAN

**The recovery of ammoniacal gases in the sugar house.** FR. ŠTĚRBA. *Listy Cukrovar.* 38, 53-4 (1919); *Z. Zuckerind. Tschoslovak.* 44, 9-11 (1919).—The largest amt. of NH<sub>3</sub> is developed during the defecation with lime and subsequent carbonation. It is estd. that from 0.01 to 0.04% of N is lost at that point. The various processes for the recovery of this NH<sub>3</sub> are reviewed.

JOHN M. KRNO

**The recovery of ammoniacal gases in the sugar house.** KARL ANDRLÍK. *Listy Cukrovar.* 38, 73-4 (1919); *Z. Zuckerind. Tschoslovak. Rep.* 44, 85-7 (1919).—A. considers



the loss of  $\text{NH}_3$  during defecation and satn. as estd. by Štěrba (preceding abstract) as too high. Considerable  $\text{NH}_3$  is present in the light juice; this is lost during evapn. So far the efforts for the recovery of this  $\text{NH}_3$  have not been entirely successful.

JOHN M. KRNO

The increase of color in juices in the factory. E. SAILLARD. *Circ. hebdom. synd. fabr. sucre*, Feb. 20, 1921; *Deut. Zuckerind.* 46, 154(1921).—By detg. the color of the various products of the factory, and calcg. it on the basis of 100 non-sugars it was found that the non-sugars in the molasses are 10 times as dark as those in the thin juice. The increase in color is due only partly to a destruction of sucrose. Expts. on the effect of heat and alkali on sucrose and invert sugar gave the following results: The increase in the color of sucrose or invert sugar solns. is about proportional to the decrease in their alkalinity; the invert sugar originally present disappears before the sucrose is attacked; that formed during the heating of the juices entirely disappears again upon prolonged heating. The quantity of invert sugar found in any one product is, therefore, no measure of the amt. of sucrose destroyed by heat.

F. W. ZERBAN

Saturation according to Pšenička. VI. STANĚK. *Listy Cukrovar.* 38, 69-71(1919); *Z. Zuckerind. čechoslovak. Rep.* 44, 73-5(1919).—The process was observed in actual operation. An expt. in the factory was conducted in order to obtain a comparison between Pšenička's, the ordinary, and the fractional carbonation methods. Analysis of juices gave results favorable to Pšenička's method. An increase of 0.35% in the purity of the juice was noted when satn. was conducted according to Pšenička, instead of by the ordinary method. This method gave a more compact sludge, thereby facilitating filtration. If the condition of the beets was normal, less lime was necessary. It has two advantages over fractional satn., namely, that it is unnecessary to sat. twice, and that there is no danger of oversatn. of the first fraction. During the last campaign, it has been used effectively on juices from partly frozen beets.

JOHN M. KRNO

Evaporation versus refrigeration in the manufacture of sugar. KARL ANDRLIK. *Listy Cukrovar.* 38, 81-3(1919); *Z. Zuckerind. čechoslovak. Rep.* 44, 135-8(1919).—Figures are given to show that the concn. of sugar juices by refrigeration is not a hopeless task and that an ultimate saving in fuel would result. Further discussion of this problem is invited.

JOHN M. KRNO

The evaporating station under pressure. J. POKORNÝ. *Listy Cukrovar.* 38, 61-5(1919).—The effect of the construction of evaporators on the time of evapn. is discussed. The data furnished were obtained from factory expts. and show that the modern vertical type of evaporators is more effective than the old horizontal type. The rate of evapn. for various types is given.

JOHN M. KRNO

Solidified molasses. ZDENEK VYTOPEL. *Listy Cukrovar.* 38, 124-5(1920).—V. prepd. a solid molasses by evapg. in the open at 120-130°. The water content equalled 5% and the purity 67.0. The mass softened at 50°. It was very hygroscopic. When exposed to moist air it softened quickly to a depth of 1 mm. This outside layer prevented the inside from absorbing further moisture although the mass was exposed to moist air for a period of several months. If powdered the molasses became sirupy in consistency after a few hrs. of exposure. Solid molasses made by evapg. in vacuum at a temp. under 100°, showed similar hygroscopic characteristics. Molasses prepd. according to the method of Scheibler-Seyferth was less hygroscopic.

J. M. KRNO

Connection between temperature and purity of cane sugar molasses. W. D. HELDERMAN. *Arch. Suikerind.* 29, 181-7(1921).—H. has repeated the expts. of Van der Linden (*C. A.* 14, 859), taking into consideration the fine grain occurring in molasses (*C. A.* 14, 860). One sample of molasses each from the defecation, carbonatation and defecation-sulfitation process were investigated by the methods of Van der Linden. The results are shown in tables, and in graphs in which the purity is plotted against the temps. 30

to 65°, in steps of 5°. It was found that cane molasses is a satd. sucrose soln., in which the soly. is affected by the non-sugars. The results are also expressed, by figures and graphs, in terms of mols. sucrose per 100 mola. water at the different temps., for the above 3 molasses as well as for the 6 investigated by Van der Linden. It was found that the curves are very similar to those for solns. of sucrose in water. However, they show sudden slight bends at certain temps., probably due to water being split off from certain compds. in the molasses, thus increasing the amt. of water at the disposal of the sucrose. It is possible that some of the water found in molasses by the usual methods does not exist in it as free water, but in the form of hydrated compds. This does not, however, affect the results and conclusions as a whole. F. W. ZERBAN

**Grain in molasses.** W. D. HELDERMAN AND C. STILMANS. *Arch. Suikerind.* 29, 253-5(1921).—Since the accuracy of Kalshoven's method of detg. fine grain (*C. A.* 14, 860) has been questioned by Dedek (*C. A.* 15, 187) and by others, H. and S. have made detns. on molasses to which known amts. of fine grain had been added. In every case the quantities found agreed closely with those added. No more water must be used in dilg. the molasses than is necessary for dissolving the fine grain. Ten g. per 100 g. molasses is the upper limit in most cases. If more water is used than necessary, appreciable errors are introduced by contraction. F. W. ZERBAN

**Redetermination of the hundred point of the saccharimeter. I. Detection of small quantities of invert sugar in the presence of large amounts of sucrose.** ANTON KRAISY. *Inst. für Zuckerind. Z. Ver. Zuckerind.* 71, 123-44(1921).—A reliable method for detg. traces of invert sugar, about 0.005%, in the presence of a large excess of sucrose, is a prerequisite for the exact detn. of the 100 point of the saccharimeter. None of the Cu-reduction methods hitherto proposed satisfies this condition. The use of Ag and Hg solns. was tried, also hypiodides, and color reactions, but all of them failed. Finally the following procedure gave satisfactory results. 25 cc. of a soln. of 7.86 g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  (2 g. Cu) per l. are mixed, shortly before use, in a 250-cc. Erlenmeyer flask, with 25 cc. of a soln. containing 3.292 g.  $\text{Na}_2\text{CO}_3$ , 20 g. Rochelle salts, and 10 mg.  $\text{HgCl}_2$  per l. Directly afterwards 10 g. of the sucrose to be examd., dissolved in water to 50 cc. vol., are mixed in another 250-cc. Erlenmeyer with 5 cc. 0.1 N  $\text{KHCO}_3$  soln. (10.01 g. per l.). Both Erlenmeyers are heated to boiling over 3-flame burners; the Cu soln. is started a little earlier so that it is already boiling when the sugar soln. begins to boil. Both flasks are placed for this purpose on wire gauze covered with an asbestos plate having a hole in the center. The heating is so regulated that the sugar soln. commences to boil in 2.25 to 2.75 min. Then the actively boiling Cu soln. is at once poured into the sugar soln. without removing the latter from the wire gauze. The boiling is continued for exactly 10 min. over a single burner, and then the soln. quickly cooled by carefully pouring 50 cc. of cold, recently boiled water down along the wall of the flask to prevent the entrance of air bubbles. The flask must not be agitated. It is cooled further by placing it in cold water for 5 min. The soln. is then acidified by carefully adding 1 to 1.25 cc. 4 N HCl, and a sufficient quantity of about 0.02 I soln. of known titer, run in while the flask is rotated. The ppt. must dissolve completely, an excess of 5 cc. I soln. being sufficient. The excess I is titrated back with about 0.02N  $\text{Na}_2\text{S}_2\text{O}_3$  soln. of known titer, with starch as indicator, until the decolorization persists for at least 10 min. The I and  $\text{Na}_2\text{S}_2\text{O}_3$  are best standardized against each other by blank tests, with water instead of the sugar soln. Under the conditions just described 1 mg. invert sugar converts 2.3 mg. Cu from the bivalent into the univalent form in the presence of 10 grams of sucrose. The amt. of Cu reduced increases with the quantity of sucrose present. A number of samples of sugar and of purified sucrose were tested by the new method, and also by Herzfeld's method, boiling for 2 min., as well as with Striegler's reagent, boiling for 5 min. The lowest amt. of Cu found by the new method was 1.7 mg. in the purified sucrose samples, with differences of not over 0.3

mg. between individual detns. In refined sugars 3 to 4.6 mg. were reduced. Striegler's reagent gave over 5 mg. in the purified sucrose samples, and Herzfeld's method over 36 mg. The Cu reduced in K.'s method is, up to 0.05% invert sugar, proportional to the latter, each mg. Cu corresponding to 0.00435% invert sugar in 10 g. sugar. Since the limit of error is 0.4 mg. Cu, 0.002% invert sugar can be detected. The reducing power of the invert sugar increases about linearly with the concn. of sucrose present. 10 g. sucrose alone begins to reduce K.'s Cu soln. perceptibly after 8 min. boiling; up to that time the Cu reduced corresponds to only 0.003% invert sugar. Variations of 0.5 min. in the time of boiling cause a change of only 0.2 mg. in the wt. of the Cu reduced; the influence of the strength of the gas flame is also negligible. K.'s Cu soln. does not deposit  $\text{Cu}_2\text{O}$  upon boiling for 15 min.; the presence of the  $\text{CuI}_2$  has no effect on the amt. of  $\text{Na}_2\text{S}_2\text{O}_3$  used in the titration. The new method can also be used for the detn. of invert sugar in raw sugars containing less than 0.05% of it; when larger quantities are present, the reduced Cu is no more proportional to the invert sugar.

F. W. ZERBAN

Refractometer corrections. HANS SCHULZ. *Z. Ver. Zuckerind.* 71, 88-91 (1921).—The temp. correction tables of Stašek (*C. A.* 3, 498) and Prinsen Geerligs (*C. A.* 2, 1357) contain not only errors of observation, but systematic errors as well. S. has calcd., on the basis of Schönrock's work, two new correction tables, for 20 and 28°, and tested them experimentally. The differences between values in these and the older tables are as high as 0.13%. The difference between the temp. of the prism and that of the soln. must not exceed 2°, if the results are to be correct within 0.1% sugar.

F. W. ZERBAN

Some notes regarding bagasse turn plates of copper and of cast steel. L. K. THOMAS. *Arch. Suikerind.* 29, 229-39 (1921).—The loss in wt. by wear of the turn plates of a four-mill installation is shown in graphs and discussed. Two of the plates were of cast steel and the other two of phosphor bronze. The cast steel plates gave satisfactory results.

F. W. ZERBAN

Installation of receivers for collecting samples of condensation waters. W. D. HELDERMAN. *Arch. Suikerind.* 29, 305-11 (1921).—Directions are given for an improved method of collecting samples from vapor pipes for the control of entrainment losses. Illustrated. Cf. *C. A.* 13, 1946.

F. W. ZERBAN

The use of steam in sugar factories. W. J. PÉNARD. *Indische Mercuur*, Dec. 17, 1920; *Arch. Suikerind.* 29, 193-207 (1921).—A number of ways are pointed out in which steam can be saved in view of the present high prices of fuel and low prices of sugar.

F. W. ZERBAN

The use of juice from the last mill for maceration. G. LOOS AND A. SCHWEIZER. *Arch. Suikerind.* 29, 21-4 (1921).—Since bagasse from the last mill rapidly diminishes in polarization on keeping (cf. *C. A.* 14, 856), it may be expected that the same is true of the juice from the last mill. No direct expts. could be made on this question, but the results of the mutual control indicate that there was a greater difference between the purity of the first mill juice and that of the last mill juice where the latter was used for maceration than where pure water was employed. This question should be studied by comparative tests, and the treatment of last mill juice with  $\text{HCHO}$  or  $\text{SO}_2$  also should be tried in this connection.

F. W. ZERBAN

Filtering material containing carbon and other substances. DAUDE. *Z. Ver. Zuckerind.* 71, 13-32 (1921).—A review of the German patent literature on bone black substitutes and decolorizing carbons.

F. W. ZERBAN

Trap for leaves and straw according to E. Preissler's design. EDUARD GOGEL. *Z. Zuckerind. tsechoslovak. Rep.* 44, 101-2 (1920).—Description of an app. for the quick removal of leaves, straw, stones and other foreign materials from the beets before they reach the automatic weigher.

JOHN M. KRNO

A distributing device for beets. EDUARD GOGEL. *Z. Zuckerind. Tschoslovak. Rep.* 44, 102-4(1920).—A description of a distributing device for feeding the beets, coming from the automatic weigher, to the cutting machines.

JOHN M. KRNO

Purification of the cossette press waters and their utilization in the manufacture of yeast feeds. REINKER. *Deut. Zuckerind.* 46, 136-8, 151-3(1921).—The press waters are first passed through strainers to remove the pulp, and then slowly through a series of tanks. In the first two of these the sand settles out. In the 2nd and 3rd the water is heated to 30-5°, and compressed yeast added. The fermentation is carried on in tanks 2 to 8, which are strongly aerated. In 10 further tanks the yeast is allowed to settle, and then removed and dried. The water, which is freed from the last remnant of floating particles by passing through 3 more flat tanks, can be sent directly to the mud basins or into the streams, without creating a nuisance. The yield of yeast may be increased by adding to the water filter press mud acidified with HCl to furnish phosphates and other nutrients. The yeast can be used as fodder, although its ash content is very high. The fermentation must be carefully controlled. It would hardly pay to recover the alc. produced. If only purification of the water is desired, lactic fermentation by bacteria can be used instead of alcoholic fermentation.

F. W. ZERBAN

Origin and prevention of sugar-dust explosions (LIEBETANZ) (BEYERSDORFER) 24. Testing of molasses as to its suitability for use in the distillery (ANON) 16. Relation between the size of the beet and the yield of beets obtained from them (URBAN) 11D. The weight of the beet root from the cultivation standpoint (PLAHN-APPIANI) 11D. Decolorizing agent for liquids (Brit. pat. 157,393) 18.

MÜLLER, ALBERT: Die Entwicklung der deutschen Zuckerindustrie. Heinz Lafaire Verlag, Hanover, Breite Strasse 6. m. 1.50. For review see *Z. Zuckerind. Tschoslovak. Rep.* 44, 52(1919).

Extracting juices from sugar beets. O. MENGELBIER. U. S. 1,372,891, Mar. 29. Coarse pieces or slices of beets are pressed by imperforate cylindrical surfaces, the residue is treated with thin liquid and again pressed. The temp. is maintained at 60° or lower throughout the operation.

Purifying and removing the odor from comminuted sugar cane. AUGUST AUMANN. Norw. 31,086, Sep. 20, 1920. The sugar cane is treated with steam at 100 to 104° until the odor and taste to be removed have disappeared.

## 29—LEATHER AND GLUE

ALLEN ROGERS

Research chemistry in the leather industry. FREDERICK DANNERETH. *Hide and Leather*, Feb. 12, 1921, p. 32 and Mar. 5, 1921, p. 61.—A general plan of organization for industrial research, a list of periodicals dealing with leather chemistry, and a few abstracts taken from these periodicals are given.

J. A. WILSON

Determination of sulfuric acid in leather. ARTHUR W. THOMAS. *J. Am. Leather Chemists Assoc.* 15, 504-10(1920).—See C. A. 14, 2102.

E. H.

Titration of chrome liquors by the conductance method. ARTHUR W. THOMAS AND S. B. FOSTER. *J. Am. Leather Chemists Assoc.* 15, 510-6(1920).—See C. A. 14, 2102.

E. H.

The mineral tannage. III. W. MOELLER. *Collegium* 1920, 552-65.—A general consideration of the subject and a partial review of the literature are given. Tanning materials are defined as substances which when brought into contact with hide form

colloidal peptized solns. which prevent the hydrolysis or fermentative decompn. of hide by becoming adsorbed in an irreversible form. The method of the exptl. procedure is given, two sets of expts. of tanning in small and large vols. are described, and some theoretical considerations are briefly discussed. The maxima of  $\text{Cr}_2\text{O}_3$  taken up by the hide depend largely upon the vol. of soln. and the time. With small volumes the time is not of as great consideration as with large vols. The expts. indicate that no equil. exists between the hide and the  $\text{Cr}_2\text{O}_3$ . This conclusion is extended to all tanning processes, all tanning processes being considered endless and dependent upon vol. and time, but not upon concn. Neutral Cr salts do not inhibit hydrolysis of the hide; the hide undergoes hydrolysis in accordance with the amt. of  $\text{Cr}_2\text{O}_3$  taken up. Therefore, Cr salts without the addition of alkalies do not constitute tanning materials. In fact, they become partly dissociated by the hide and are turned into an incomplete tanning system, but behave in spite of it similarly to acids. Only upon the addition of alkalies to the Cr salts does hydrolysis of the hide cease and a proteolytic const. appear.

B. S. LEVINE

The composition, examination, and choice of leather fats and leather oils. J. PRITZKER AND R. JUNGKUNZ. *Schweis. Chem. Ztg.* 1920, 497-507.—The purpose of the investigation is to bring out the importance of leather fats and leather oils in the prepn. of leather, and to make known the compn. of a series of leather fats. An analytical method is suggested for the examn. of the leather fats, and certain requirements are set forth to facilitate the choice of proper fats. A good leather fat should be homogeneous, be plastic, and should easily penetrate the leather. The percentage of volatile substances should not exceed 1%. The ether-insol. residue of colored fats, containing such substances as soot, should be around 0.2%. More than that will tend to fill the pores of the leather and prevent proper penetration of the leather by the oil. Rosin and rosin oil should not be applied to leather. Mineral matters such as ash, sand, etc., generally are to be avoided, and the ash content should not exceed 0.2%. The acidity must be low, and must not be of either a resinous or mineral origin. Leather fats of an acidity over 30° should be discarded. It is not possible to establish limits for the % of unsaponifiable matter in the fats, but the minerals, fats and oils admixed should be free from acid. The greater the % of the saponifiable matter, the more suitable is the fat for leather. Substances such as nitronaphthalene and the like may be added to the fats. Leather fats and leather oils used in the prepn. of Russia leather will contain mineral fat and oil. The melting point of leather fats should be 35-40° but not higher. In case harder fats must be used they are applied after being warmed.

B. S. LEVINE

DAVIDOWSKII, F.: Die Leim- und Gelatine-Fabrikation. 5th Ed. revized and enlarged. Wien and Leipzig: A. Hartlebens Verlag. M. 6. For review see *Deut. Färber-Ztg.* 57, 374(1921).

PILGRIM, J. A.: Indian Tanstuffs. Calcutta: Superintendent Government Printing, India. 6 annas. For review see *J. Soc. Chem. Ind.* 40, 136R(1921).

Apparatus for drying skins or hides. C. W. CASS and W. L. BAXTER. U. S. 1,372,337, Mar. 22.

Synthetic tanning agents. ELEKTROCHEMISCHE WERKE Ges. Brit. 158,512, Jan. 10, 1921. Synthetic tanning agents are prepd. by heating naphthalene, retene, carbazole, or the like, with glycolic acid and  $\text{H}_2\text{SO}_4$ , or by heating naphthalenesulfonic acid with glycolic acid *in vacuo*.

Tanning. CHEMISCHE FABRIKEN WORMS AKT.-Ges. Brit. 157,851, Jan. 10, 1921. Hides are tanned with the alk.-earth salts of synthetic tanning agents of the kinds described in 156,254. According to an example, a mixt. of naphthalene and phenol is

sulfonated and condensed with HCHO soln., the product is dild., neutralized with CaO, and filtered, and the soln. used for tanning. The products may be employed alone or mixed with other tanning agents.

**Synthetic tanning agents.** CHEMISCHE FABRIKEN WORMS AKT.-GHS. Brit. 157,852, Jan. 10, 1921. Synthetic tanning agents are prepd. from tars or tar oils by coupling the components thereof by appropriate elements or radicals without isolation of the components from the tars or oils, and solubilizing the products by introducing acid groups before or after the coupling. According to examples; a tar oil is heated with  $P_2O_5$  and concd.  $H_2SO_4$  and the product neutralized or nearly neutralized with alkali; a tar oil is sulfonated and condensed with HCHO and neutralized as described above; coal-tar is treated with concd.  $H_2SO_4$  and the product nearly neutralized by NaOH; a tar oil is sulfonated and condensed with HCHO and neutralized as described above; coal-tar is treated with concd.  $H_2SO_4$  and the product nearly neutralized by NaOH.  $H_2SO_4$  may be replaced by chlorosulfonic acid, etc. The products may be used in tanning alone or mixed with other tanning agents. Hides tanned with these materials may be dyed by treatment with diazo compds.

**Synthetic tanning agents.** CHEMISCHE FABRIKEN ASPHALTWERKE AKT.-GHS. Brit. 157,855, Jan. 10, 1921. Synthetic tanning agents are prepd. from tars or tar oils by introducing acid groups without isolating the components from the tars or oils, converting the acids into their metal salts, and then coupling these salts by appropriate elements or radicals. According to an example, a tar oil is sulfonated by concd.  $H_2SO_4$ , the product is made alk. with NaOH,  $Na_2CO_3$ , or CaO, and then condensed with HCHO soln. The products may be used in tanning, alone or mixed with vegetable or mineral tanning agents. Cf. 157,852 (above).

**Synthetic tanning agents.** CHEMISCHE FABRIKEN ASPHALTWERKE AKT.-GHS. Brit. 157,856, Jan. 10, 1921. Synthetic tanning agents are prepd. from tars or tar oils by converting the components thereof into phenols by sulfonation and alkali, fusion, coupling the resulting phenols by appropriate elements or radicals, and solubilizing the products by introducing acid groups; alternatively, the acid groups are introduced into the phenols and the metal salts of the products then coupled. According to examples, a tar oil is sulfonated and converted through the Ca salt into the Na salt, which is then subjected to alkali fusion; the resulting phenol is heated with  $P_2O_5$  and  $H_2SO_4$  and the product neutralized or nearly neutralized with alkali; or the phenol is sulfonated by concd.  $H_2SO_4$  and condensed with  $S_2Cl_2$  and the product nearly neutralized with NaOH; or the phenol is sulfonated and condensed with HCHO and neutralized as described above, or, alternatively, the phenol is sulfonated, the product made feebly alk. and condensed with HCHO, the resulting soln. being made feebly acid before use. The  $H_2SO_4$  may be replaced by  $Na_2SO_4$  or  $NaHSO_4$ , etc. The products may be used in tanning, alone or mixed with other tanning agents. Hides tanned with these materials may be dyed by treatment with diazo compds. Cf. 157,852 (above).

**Treating leather.** C. R. REUBIG. Brit. 157,864, Jan. 10, 1921. Dressed or undressed leather tanned by any process is treated with a soln. of  $Na_2S$ ,  $Na_2S_2O_4$  and HCl,  $H_2SO_4$  or other inorg. or org. acid, the action being accelerated by addition of caustic alkali. The process is stated to soften hard-grained or, brittle leathers, producing a velvety effect, also to decolorize or clear stained or darkened tanned or retanned leathers, and may be used for finishing or in prepn. for dyeing. It may be used in place of or in conjunction with combined chrome and vegetable or other mixed tanning, and for degreasing dressed or undressed chrome or other leathers, the degreasing effect being increased by the addition of the caustic alkali, preferably NaOH.

**Treating leather.** H. BURGER. Brit. 157,929, Jan. 10, 1921. Naphthalene or a member of the naphthalene group of equiv. value, either alone or in conjunction with currying substances dissolved therein, is employed for soaking and dressing, impreg-

naïng or currying leather. Fat, paraffin wax, caoutchouc, resin, asphalt, etc., also S and S compds. may be dissolved in the naphthalene. The leather is immersed for half a min. or a min. and then dried without being washed.

Substitute for "patent-leather." H. J. HAON. U. S. 1,372,021, Mar. 22. In forming "patent-leather" substitutes, a woven fabric is coated with a material such as a pyroxylin mixt. and the coated fabric is embossed to obtain a grain sufficient to hide the appearance of "clothiness" and additional coating material is then applied to the same side of the fabric.

Casein glue. A. U. MESSMER. U. S. 1,373,518, Apr. 5. A glue adapted for use as an adhesive or sizing is formed of natural soured or lactic acid casein 100,  $\text{Na}_2\text{PO}_4$  17,  $\text{Ca}(\text{OH})_2$  25,  $\text{NaCl}$  5, rosin or other resin 0.3 and an oil, e. g., petroleum 4.7 parts.

Waterproofing and sizing composition. A. E. CRAVER. U. S. 1,373,412, Apr. 5. A compn. adapted for waterproofing and sizing or use as an adhesive is formed of a casein glue or other adhesive comprizing a protein rendered insol. after application by heating with formaldehyde sulfoxylate or a similar compd.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Changes in plantation rubber on storage. O. DE VRIES. *Arch. Rubbercult.* 5, 130-41 (1921).—Although the external appearance of raw plantation rubber deteriorates somewhat on storage for several years in the tropics, the vulcanizing properties, according to expts. on samples kept for 2-4 years in cupboards or for 2 years in chests in warehouses, do not deteriorate. After storage, the tensile strength and slope are unchanged. The rate of cure increases somewhat. Seventeen samples of latex rubber examd. after being kept for 4 years showed an increase in rate of cure of about 15%. The viscosity is the only property that falls. Some samples of lower grade crepes were found to be unchanged in tensile strength and slope after 2 years and to have changed in rate of cure only slightly. Other samples of such crepes, particularly of earth rubber, deteriorated markedly. Like latex crepe, matured rubber remained unchanged in tensile strength and slope. The rate of cure of this rapid-curing rubber, however, generally fell somewhat. It was found previously (*C. A.* 14, 3168) that some samples of abnormally slow curing rubber increased in rate of cure on keeping. Hence variation in rate of cure among plantation rubber samples tends to some extent to diminish on storage.

G. S. WHITBY

An improved method for the determination of total sulfur in rubber. M. LEVIN AND S. COLLIER. Bur. of Standards. *Rubber Age* 9, 47-8 (1921).—The method of Waters and Tuttle is modified by reducing the quantity of  $\text{HNO}_3$ -Br mixt. to 5 cc. and adding 5 drops of Br in addition; instead of evapg. the soln. to dryness, after heating for 1 hr. the acid is neutralized with 5 g. of  $\text{Na}_2\text{CO}_3$ . A correction for the occlusions in the  $\text{BaSO}_4$  ppt. is introduced. Cf. *C. A.* 6, 1540.

J. B. T.

Oils, fats, waxes and resins used in the rubber industry. FREDERIC DANNERTH. *India Rubber World* 64, 563-66 (1921).—A review.

J. B. T.

Specifications of the Bureau of Aircraft Production, U. S. A. ANON. *India Rubber World* 64, 577-8 (1921).—Specifications for elastic cord for Holt Flare Bracket Tension Strap (577); rubber hags for gasoline tanks (577-8).

J. B. T.

Recent progress in rubber chemistry and technology. I, II, III and IV. PHILIP SCHIDROWITZ. *Chem. Age* (London) 4, 272-4, 298-300, 326-8, 354-5 (1921).—A review, containing no new matter.

J. B. T.

Solubility of crystalline substances in rubber. G. BRUNI. *Giorn. chim. indust. applicata*, Feb. 1921.—The soly. in deresinated rubber of azobenzene, of naphthalene

and of *p*-toluidine has been studied by observing the temp. at which crystals first separate when clear, warm mixts. in various proportions are allowed to cool slowly. Preliminary observations were made under the microscope on a Pfeiffer warm stage. Exact detns. of the solidification points were made by immersing a thermometer in 25 g. of each mixt. The temps. of incipient crystn. found for mixts. of azobenzene and rubber (total, 100 parts), were as follows: Parts azobenzene: 100, 98, 95, 90, 80, 75, 70, 60, 50, 40, 30; temps.: 69.0, 68.95, 68.6, 68.6, 67.2, 66.2, 65.7, 63.1, 59.2, 52.1, 43.4°. The first 4 mixts. were made by dissolving the rubber in molten azobenzene; the last 5 were made on mixing rolls; the other 2 were made by both methods. When the temps. are plotted against concns. of rubber, a smooth curve is obtained. The results with naphthalene and with *p*-toluidine were similar. It is concluded that such systems behave as ordinary 2-component systems, the rubber behaving to the cryst. substances in question as an ordinary solvent, forming true satd. solns. G. S. WHITBY

**The use of brackish water in the preparation of Hevea rubber.** W. SPOON. *Arch. Rubbercult.* 5, 115-29 (1921).—The use of water from tidal rivers for the diln. of latex may affect the compn. and vulcanizing properties of the rubber. The effects produced are shown in an exaggerated form by using sea water. The moisture content, ash and water ext. are increased; the tensile strength, rate of cure and viscosity are diminished; the slope is unaffected. The effects are more marked in the case of sheet than in the case of crepe. Where sea water was used, the extreme case quoted showed changes in the first six quantities mentioned above of from 0.84 to 2.89%, 0.33 to 1.13%, 0.61 to 0.89%, 1.41 to 1.07 kg. mm.<sup>2</sup>, 180 to 115, 30.5 to 28.5, resp. Expts. made with the object of ascertaining to what extent water need be brackish in order to affect appreciably the properties of the rubber indicated that in the case of sheet the presence of about 12% and in the case of crepe of about 28% of sea water represents the extent in question. G. S. WHITBY

#### State legislation and carbon black manufacture (KITCHEN) 18.

**Coagulating latex.** E. HOPKINSON. *Brit.* 157,975, Jan. 11, 1921. Latex is sprayed in a current of a drying medium (air, CO<sub>2</sub>, etc.) which may be heated, e. g. to 200° F., to obtain a product containing all the solid constituents of the latex, and the white cheese-like product is compressed. Premature coagulation is prevented by the addition of NH<sub>3</sub> or the like. Vulcanizing agents as S, nitro compds., S compds., and fillers, e. g. C black, ZnO, etc. may be added to the latex or they may be introduced into the spraying chamber with the latex. When additions are made to the latter the preservative added is preferably saponin, glycerol or glue in the proportion of about 0.1%. The mixing thus obtained is more homogeneous, does not require drying, mastication is rendered unnecessary, and after vulcanization by the usual methods, a product of greater tensile strength is obtained.

**Coagulating latex.** E. HOPKINSON. *Brit.* 157,978, Jan. 11, 1921. The whole of the solid constituents of latex is obtained by spraying latex in a stream of a drying medium (air, CO<sub>2</sub>, etc.) heated to about 200° F. Vulcanizing and compounding ingredients may be added and sprayed with the latex to which has also been added a preservative such as NH<sub>3</sub>, or, in the presence of fillers, etc., saponin, glycerol or glue. A suitable app. is specified.

**Molding and vulcanizing rubber.** F. T. ROBERTS. *Brit.* 157,413, Jan. 10, 1921. Molds for molding or vulcanizing rubber articles are obtained by sand-casting an alloy containing a large proportion of Al and a small proportion of Mg, e. g., 97% Al and 3% Mg. The sand mold may be made from a plaster cast of a pattern of the article.

**Devulcanizing rubber.** J. SMITH. *Brit.* 158,783, Dec. 24, 1919. Rubber is finely divided, impregnated with a cold soln. of alkali (caustic, carbonate, or bicarbonate),



preferably concd., transferred to a closed vessel and heated to a temp. corresponding to a pressure of 100 lb. per sq. in. The alkali and S are washed out with cold  $H_2O$ . The rubber may be further treated with hot  $H_2O$  and  $HCl$ . Cf. 11,159, 1899, 17,313, 1904, 2,655, 1905, 29,878, 1912 (C. A. 8, 2072) and 28,167, 1913 (C. A. 9, 1407).

Rubber composition. D. REPNY. U. S. 1,372,041, Mar. 22. A rubber compn. free from "scorched" spots is prepd. by first mixing rubber and the other compounding ingredients employed, except the S, then admixing S which has been previously treated with a lubricant such as oil or tallow and vulcanizing the entire mixt. The lubricant prevents undue heating during mixing.

Rubber compositions. INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS Co., Ltd. Brit. 157,821, Jan. 210, 1921. A compn. suitable when in sheet form for making soles and heels of boots, steam- and water-tight joints, etc., consists of rubber 50 parts, S 10 parts, disintegrated waste fabrics coated with non-vulcanized rubber, 39 parts and an accelerator such as *p*-nitrosodimethylaniline, stated to be known as "accelerine," 1 part. The fiber is applied to a film of rubber on a cylinder, the other ingredients are added, the mass is calendered, and cut into sheets which are superposed, and vulcanized for an hr. at  $149^\circ$ .

Porous rubber mixtures. PHILIP SCHIDROWITZ and HAROLD ALBERT GOLDSBROUGH. Ger. 321,092, Aug. 2, 1914. To the rubber latex together with S, sulfides or S solns. and in certain cases acids are added substances which decompose on heating or upon addition of acid, liberating gases and the mass is vulcanized without being dried. The latex may be mixed with the above mentioned substances in the course of the coagulating process, and the product then vulcanized. In addition to the substances mentioned, fibrous materials, dyestuffs, vulcanizing accelerators, and fillers may be incorporated with the latex. Finally, the porous rubber mixt. may be formed on suitable bases (textile fabrics or the like).

Non-inflammable compositions. W. H. PERKIN, J. H. MANDLEBERG and J. MANDLEBERG and Co., Ltd. Brit. 159,014, Nov. 18, 1919. The compn. of rubber, hydrated  $Al_2O_3$ , litharge, and S, with or without asbestos, described in 125,622 (C. A. 13, 2300) as an impregnating compn., is used by itself in sheets, blocks, tubes, etc. For an *electrically insulating compn.*; mineral rubber and paraffin wax are added.

Rubber substitutes. WESTERN RUBBER Co. Brit. 157,836, Jan. 10, 1921. Rubber substitutes are made by heating a dry and air-free mixt. of S and any animal or vegetable fixed oil, plain, blown, or oxidized, in a closed vessel until the reaction is complete. Preferably the mixt. is also agitated, and  $ZnO$ , litharge,  $MgO$ , or other catalyst or accelerator is employed. Oils specified are fish oils, linseed, rape-seed, hempseed, and cottonseed. In one example, 90 parts fish oil and 10 parts S are heated to  $175^\circ$  for 4 hrs.; the product is dried and free S removed by heating to  $140^\circ$  in open vessels.







